TECHNOLOGY DEPT.

APRIL, 1951

Telephone and Management Engineer

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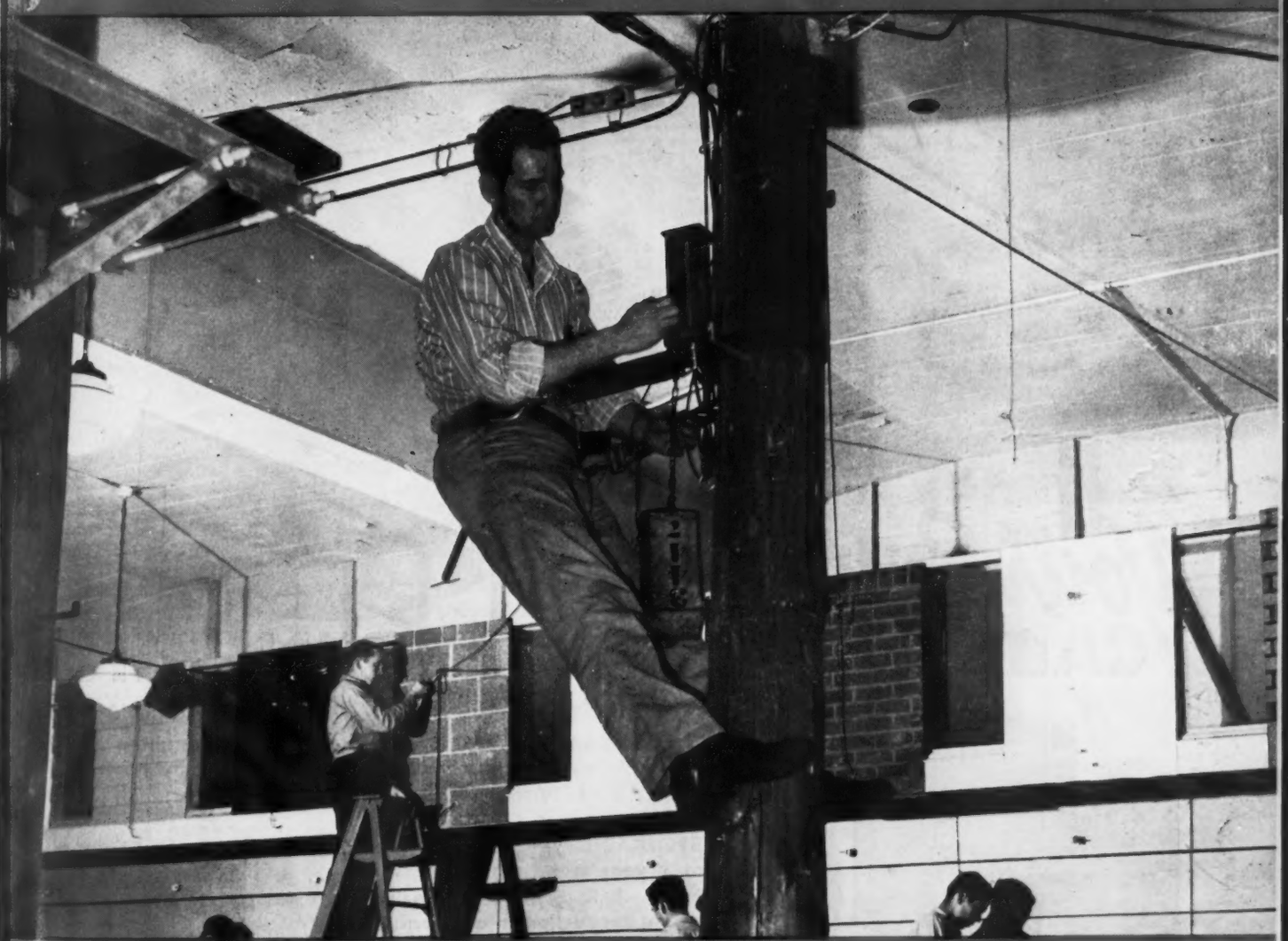

THE NATIONAL TELEPHONE MAGAZINE

Featuring In This Issue —

- **Drop Wire Cable Maintenance Methods, by John S. Reed**
- **Improved Customer Service, by H. G. Turner**
- **Thoughts About Material Procurement, By John P. Boylan**
- **Brush Control & The Public, By Dr. A. E. Carlson**

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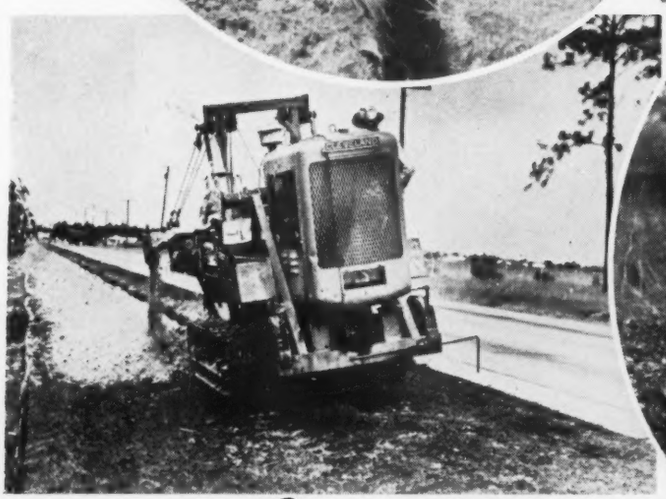

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Portion of 26-cell FME-21 Exide-Manchex Battery serving Plymouth Exchange.

A new exchange—another new installation of dependable

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The new Plymouth, Wisconsin, exchange of the Commonwealth Telephone Company cut over at 6:00 A.M., October 25, 1950. And helping to bring it into operation was a battery of 26 FME-21 Exide-Manchex Cells.

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1888 . . . DEPENDABLE BATTERIES FOR 63 YEARS . . . 1951

Across The Editor's Desk

For some very interesting reading we commend to you the Special Edition of the magazine "HELLO" issued by CARL BROREIN, president of the Peninsular Telephone Co., Tampa, Fla. on the Golden Anniversary of that company. The magazine is issued by and to the employees of the company. Profusely illustrated, the magazine gives a pictorial history of the company since its organization. Well done, Editors Gene Henderson and J. Hartwell Jones!

• • •

The Armed Forces Communications Association national convention meets at the Drake Hotel, April 19. THEODORE S. GARY, Chicago, well known nationally in the Independent telephone industry, is president of the Association. Other names well known in our industry that will serve on the program are JAMES H. KELLOGG, Chicago, and COL. WM. C. HENRY, Bellevue, Ohio.

• • •

Among the features of the coming convention of the Illinois Telephone Association at Peoria will be a Pioneer Luncheon on April 20th. It will be sponsored jointly by the R. B. STILL PIONEER CLUB and the Illinois Commercial Pioneer Club of the Independent Telephone Pioneer Association. All club, chapter and direct members of the Independent Pioneers are invited to attend. Independent Telephone Pioneer Association consists of Independent telephone people having 15 or more years service to the telephone industry. Application blanks are available at our offices to those wishing to apply for membership. Consider this an invitation.

• • •

Congratulations to WILLIAM F. MILLER, secretary-treasurer of the Iowa Independent Telephone Association, on the record breaking meeting of that group in Des Moines last week. E. G. CARLSON, Creston, was chairman of the committee in charge of the convention and each member is to be congratulated on their efforts. The program was well prepared and could easily be adapted for use by many of the state associations.

The National Telephone Magazine

TELEPHONE ENGINEER and MANAGEMENT

APRIL, 1951 **VOL. 55, NUMBER 4**

Editor, RAY W. SMITH • *Advertising Director,* ROY F. SMITH
Managing Editor, JOHN G. REYNOLDS
Promotion Manager, DON C. SORENSEN
Washington Bureau, ROLAND C. DAVIES *and* FRED HENCK
Circulation Manager, JUNE LEWIS
Production Manager, VIRGINIA McCOLLUM

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FRONT COVER

Student Al Bailey of Michigan Bell studies outside installation procedure in plant school classroom. The school does not strive to turn out finished and completed "products" but it does give a man enough at first to become familiar with the job he is to do. Further training on the job then continues under the guidance of the employee's supervisor. *(Courtesy of Michigan Bell.)*

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The Open Forum

". . . Unhealthy Condition

To THE EDITORS—There are too many instances in the country where an Independent telephone company is completely surrounded by Bell System companies and vice versa. This makes for a very unhealthy condition.

Let me give you an example. The owner of a very small exchange came to see me recently. He was in trouble. He operates in a town of 200 people and has 90 telephones. His longest line goes four miles into the country. That is the end of his territory. He is completely surrounded by the Bell System and they come within two miles of his town at the closest point. The Bell subscribers have dial service over metallic lines.

The Independent company has magneto service over noisy grounded lines. Naturally, the Independent company subscribers want improved service which they are entitled to. However, the local owner cannot afford to give it to them. He cannot sell the company. It is too small. The Bell company will not take it over. What is the outcome going to be? I know and you know. Eventually another community without telephone service. Another reflection on the Independent industry. That is just one example. There are also instances where the company in the middle is a Bell company that could be more economically operated by one of the surrounding Independent companies.

Surely there are situations like this all over the United States. Not just in my state.

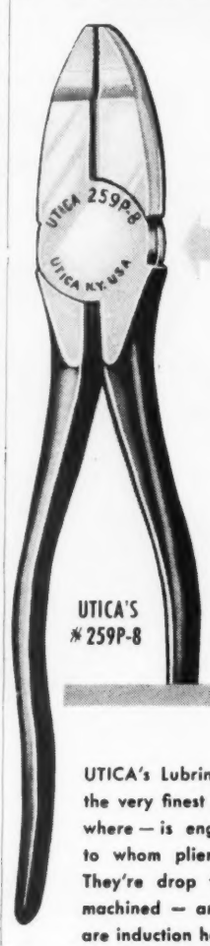
I'm wondering if some sort of an arrangement couldn't be worked out whereby there could be an exchange or sale of properties whereby the Independent industry would be able to buy the Bell company property or vice versa.

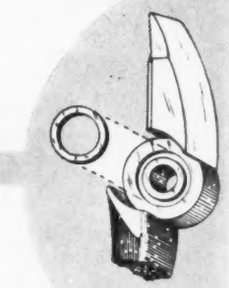
Something has to be done! Perhaps someone has the answer to the problem—because it is a problem that is going to reflect back on both the Independent and the Bell companies —and a problem that must be solved.

WALT PIRNER
SECRETARY,
SOUTH DAKOTA TEL. ASSOC.,
DELMONT, SOUTH DAKOTA.

Thanks, Walt, for pointing up a problem that does exist in many sections. Perhaps an "Open Forum" reader has a solution. If so, send it in. Publication of your suggestion may help many companies.—THE EDITORS.

PLIERS THAT OIL THEMSELVES!





Exploded view of joint

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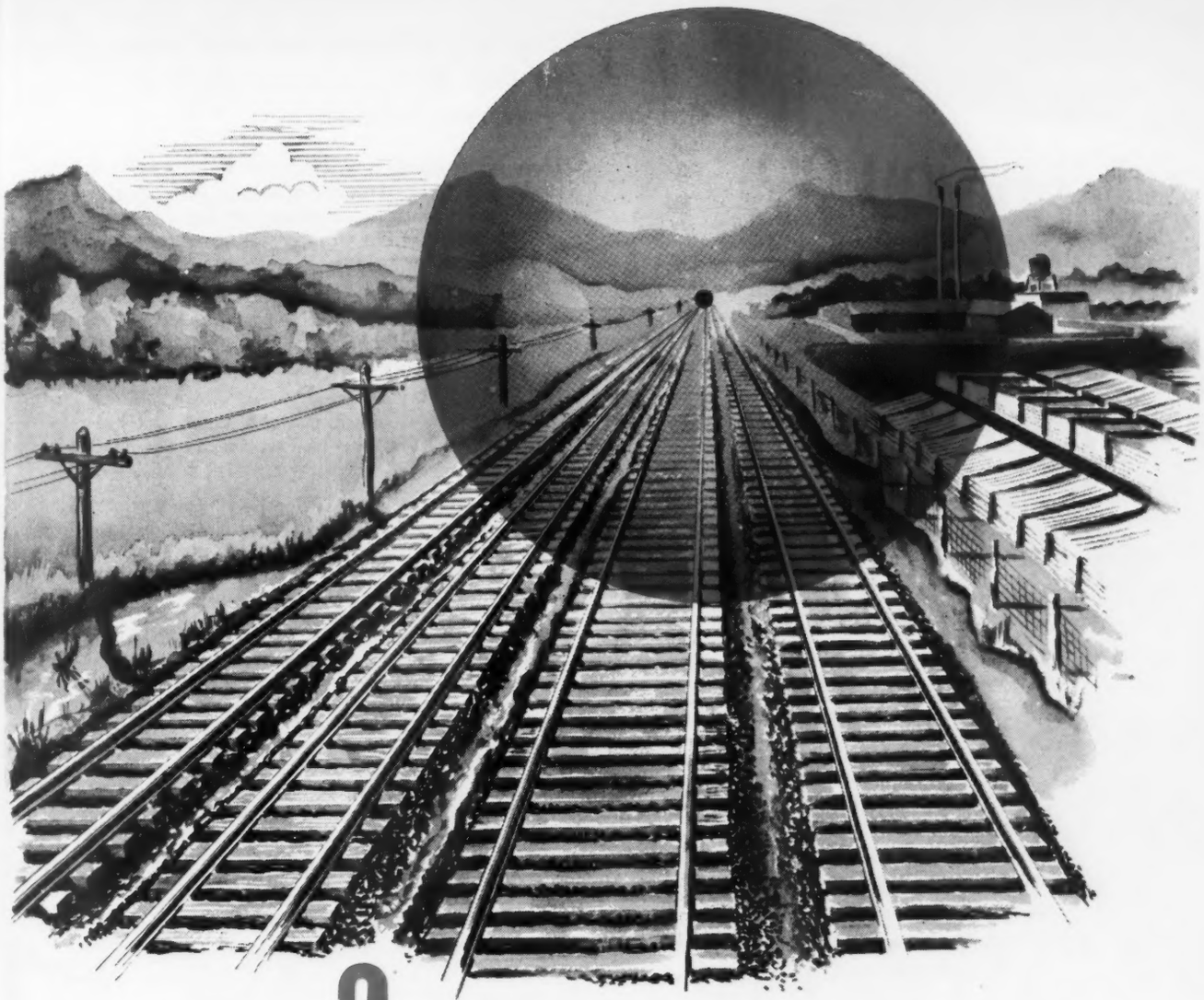

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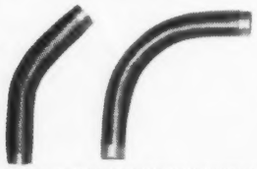

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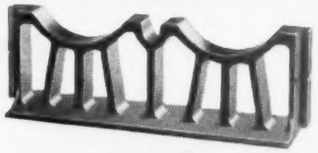

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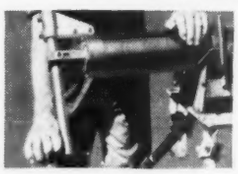

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Fortnightly TELEPHONE ENGINEER ★ TELEPHONE ENGINEER AND *Management*

ON THE 1st OF EACH MONTH ON THE 15th OF EACH MONTH

NEWSLETTERS *on Alternate Weeks*

April 15, 1951

Dear Sir:

Federal Communications Commission (FCC) on March 21 proposed changes in its rules to revise upward revenue criteria for Class A, B, C, D telephone companies. Action was taken primarily because normal increases in stations served by companies, plus higher rates, have placed many organizations in higher accounting classifications, & more extensive accounting information has been required of them. Some companies, as result, have faced prospect of hiring additional accounting assistance, although actually their methods of operation have not changed.

Proposed new classifications are: Class A, in excess of $250,000 in annual gross revenues (as contrasted with $100,000 at present); Class B, $100,000 to $250,000 (compared with $50,000 to $100,000); Class C, $50,000 to $100,000 (as against $25,000 to $50,000); & Class D, below $50,000, compared with present standard of below $25,000.

Changes are proposed to go into effect as of Jan. 1, 1951, so they would be effective for current calendar year if approved. Comments are to be filed by April 16, with any comments on filing of others due by April 30.

* * *

238-page report, with one basic recommendation -- creation of 3-member Telecommunications Advisory Board to formulate national telecommunications policy -- was issued by White House, March 27. Report of Communications Policy Board appointed more than year ago was made public without comment.

It was understood report was received on Capitol Hill with some disappointment because no legislative proposals were included, & that government agencies concerned with communications would not give it their full approval. In Washington, it was felt Board had done excellent job of pointing up problems facing communications industry & government today, but without offering any adequate solution. It was pointed out that only fundamental recommendation of Board was that new policy agency would be established & remain under executive branch of government.

* * *

Ater nearly year of hearings, many with sensational charges, Senate special crime investigating committee appears to be no nearer to solving problem of use of interstate communications for bookmaking purposes than

it was when it started. Although committee's life has been extended until May 1, & its report will not be available for about month, its legislative recommendations regarding communications were beginning to take shape as follows: (1) FCC would issue annual licenses to persons engaging primarily in distributing information concerning horse or dog races, treating them much same as common carriers; (2) Commission would not issue licenses until it was satisfied that information would not be used primarily for violation of state laws; (3) news services would be required to furnish lists of their subscribers & drops to FCC, thus giving local law enforcement authorities material to work with.

Chairman Coy vigorously opposed plan in appearance before Kefauver committee last week, stating it would put intolerable administrative burden on FCC.

* * *

HIGHLIGHTS: -- William R. Porter, chairman, Mid-Tel. Co-op, Circle, Mont., headed for Washington, D. C., to consult with REA's telephone div'n. on loan application. Co-op has 1,175 applicants for service . . . Interesting new booklets available. Write our Free Literature Editor for your copies of folders entitled, "How To Stop Payroll Headaches Before They Start."

Joe A. Knippling is chairman of new Buffalo Range Tel. Co., Gann Valley, S. D. Company plans consolidation of rural lines & rural tel. expansion project . . . Lincoln County Tel. Co. completed automatic conversion project at Harrisburg & Tea, S. D. . . . Harry T. Westcott appointed member of North Carolina Utilities Commission; succeeds Robert G. Johnson.

Citizen's Committee on Improvement of Tel. Service formed at Miami, Ariz. Lewis A. Sprain, field representative, Applications & Loans Div'n., REA, addressed recent meeting. Group is planning telephone service to 17 communities . . . Pat Garaghan heads committee planning organization of tel. co-op to serve rural area in Goldendale, Wash., vicinity . . . Three Rivers Rural Tel. Co-op organized at Belt, Mont. George Grosskopf, Jr., Bob Antonich, Mrs. Geo. Nelson are members of organizing committee . . . Earl Davis, Hyattville, Wyo., is pres. of newly-formed Tri-County Tel. Co-op. Group is preparing application for REA loan.

Central Iowa Tel. Co. installing telephones in Forest City, Ia.; exchange will be converted to automatic operation . . . J. F. Van de Vusse, gen'l. mgr., Union Tel. Co., Owosso, Mich., announced plans for $1,300,000 expansion program . . . Oregon-Washington Tel. Co. announced $6,000,000 expansion program for Yakima Valley. Company plans to convert Granger, Sunnyside, Prosser, Whitstran, Grandview, White Swan, Wapato & Toppenish to automatic operation . . . Midwest Tel. Co. installed new swbd. at Miltona, Minn.

Ray W. Smith, Editor

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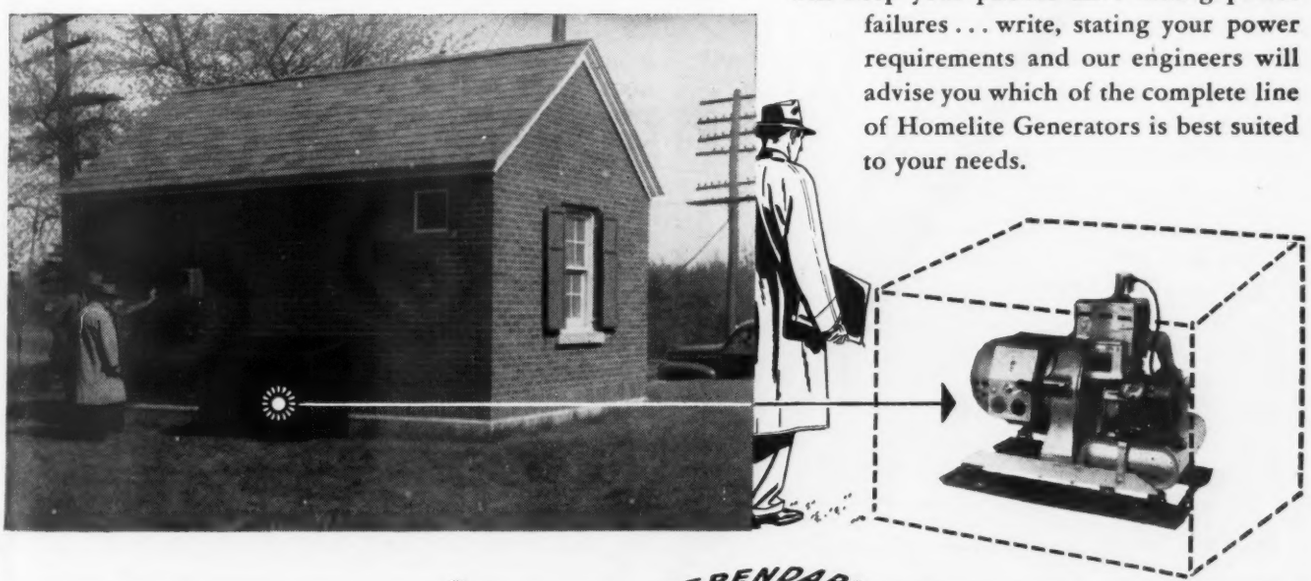

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L-120 International Truck (5,400 pounds GVW) with stake body —one of the 87 basic models, thousands of specialized variations in the world's most complete line of trucks.

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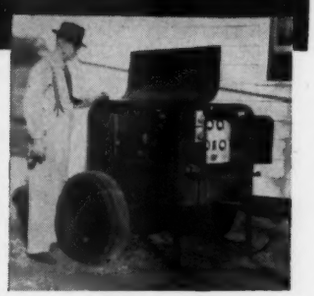

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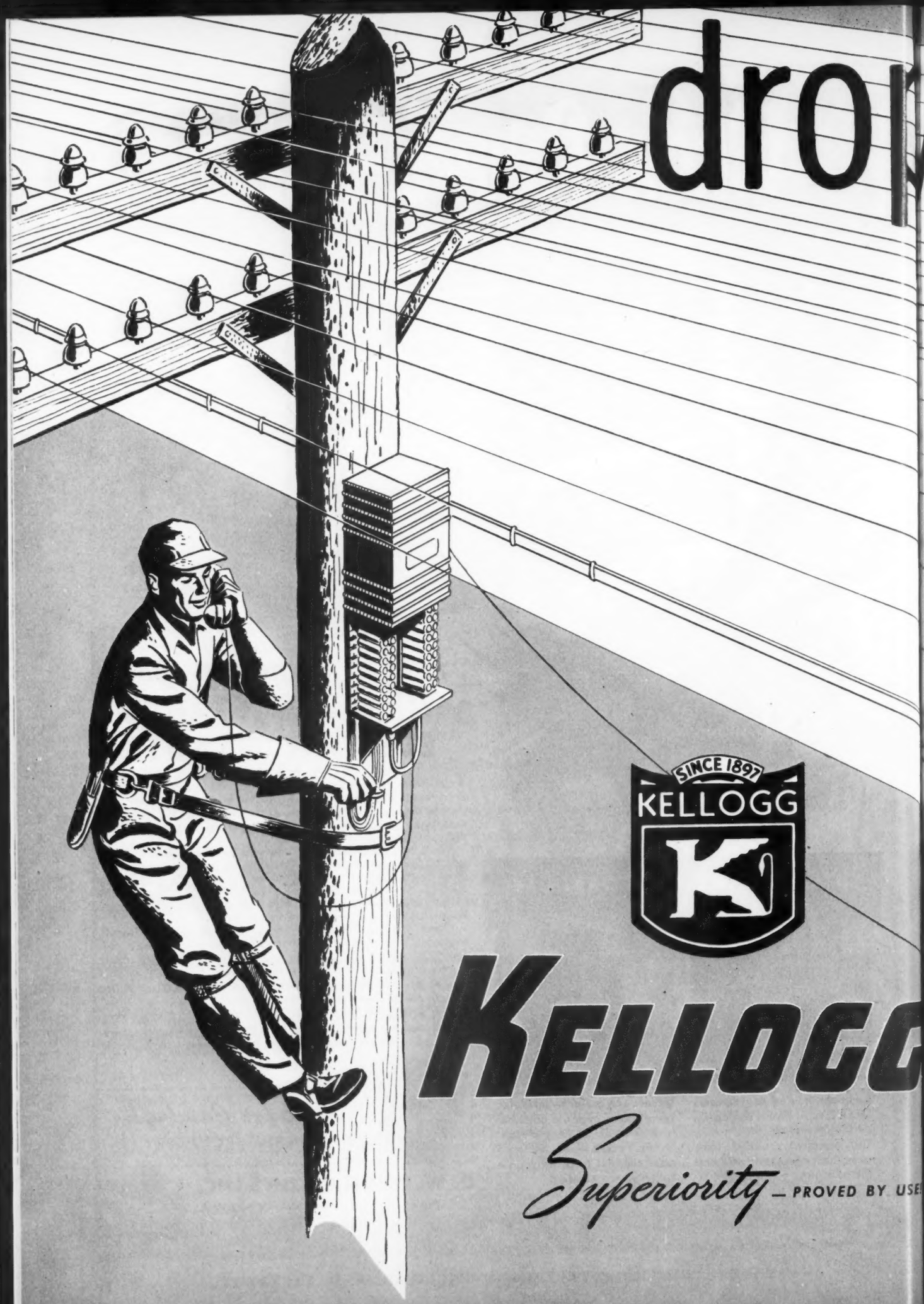
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Drop wire worries can be discarded—now that Kellogg has an abundance of Copperweld Drop Wire! . . . Whether you have been stewing about replacing old drops or stringing new ones, Kellogg's warehouses in Chicago, Dallas, San Francisco and Kansas City are in position to shell out the wire! . . . In addition to availability, this Copperweld Drop Wire provides high quality at low cost!

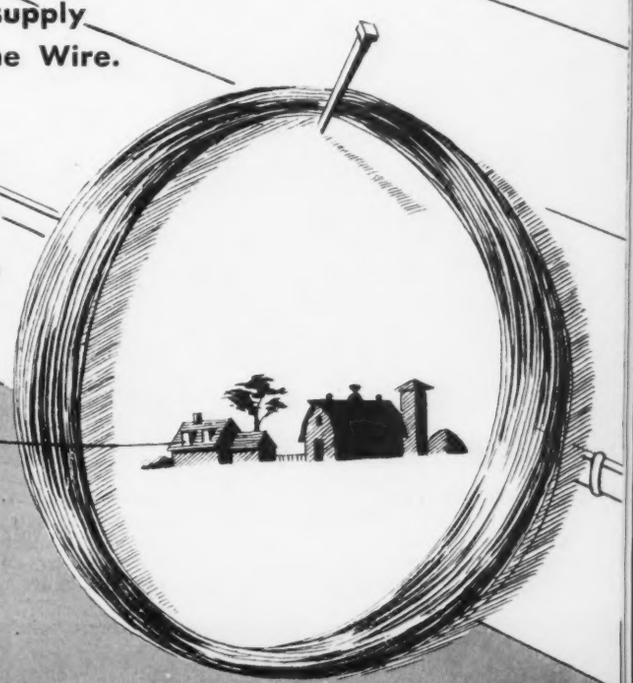
The No. 18 Copperweld is as strong as the No. 17 of other types. Just as strong, but it costs less! It has a breaking strength of 340 pounds for the pair. Many companies have reduced their drop wire costs by standardizing on No. 18 Copperweld. Kellogg has it in twisted pair or parallel construction in a wide variety of insulations and jackets.

P.S. **Kellogg also has a plentiful supply of Copperweld Bare Line Wire.**

FOR PROMPT *delivery*

Telephone Supply Sales at Kellogg's Chicago Office. PO rtsmouth 7-6900, or

Wire Kellogg Switchboard and Supply Company, Dept. 2-D-3, 6650 South Cicero Ave., Chicago 38, Illinois

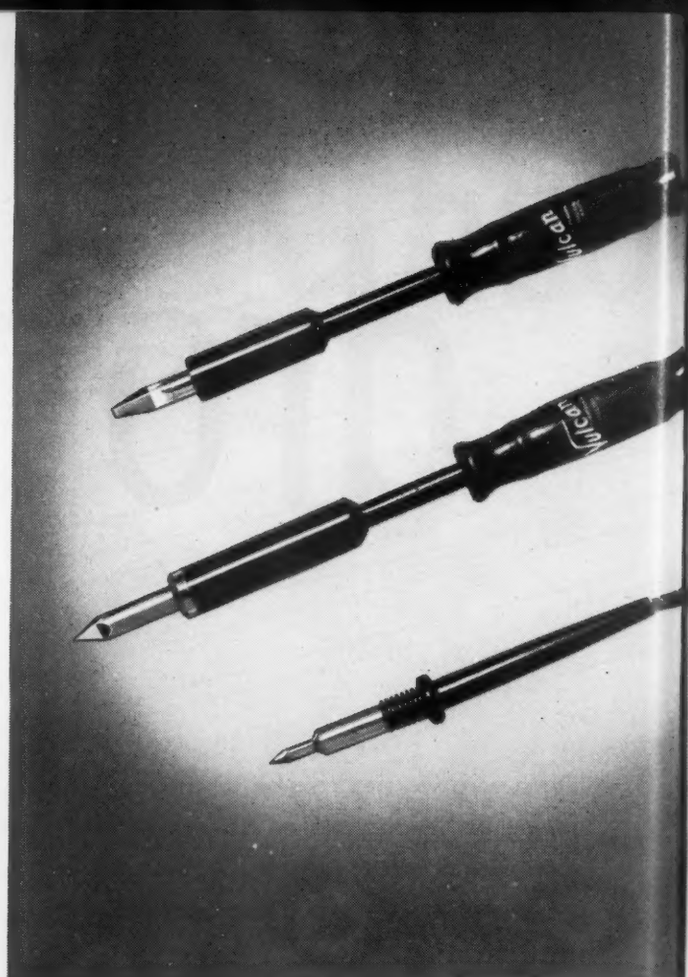


• Kellogg is the exclusive distributor of insulated telephone wires as furnished by Paragon Electric Co., and General Insulated Wire Works.

Factory and Offices of
Kellogg Switchboard and Supply Co.

Manufacturers as well as distributors of the finest quality equipment and supplies for the independent telephone field for over fifty years.

For Dependable Power, standardize on Gould Planté Batteries— the finest stationary batteries money can buy. Thick grooved, pure lead positive plates enable them to deliver an amazing number of years of trouble-free service. No wonder they're known everywhere as the aristocrat of batteries. Made by GOULD-NATIONAL BATTERIES, INC.



Neat, Precision Soldering is easy when you use a Vulcan Electric Soldering Iron. The high-powered heating element assures a long life of unimpaired heat production. These VULCAN ELECTRIC CO. irons come in various sizes of screw and plug-tip types. Also included is the "Pygmy" —a pencil type electric soldering tool used for work in cramped spaces.

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When you order from Kellogg, you fill out just ONE order form for *all* your line supplies. Saves you time and work! Then your order gets prompt attention by experienced telephone men. No chance for slip-ups here! Finally, we ship quickly, from the distribution point nearest you. It's fast, sure service, and every item is *guaranteed!*

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SUPPLIES

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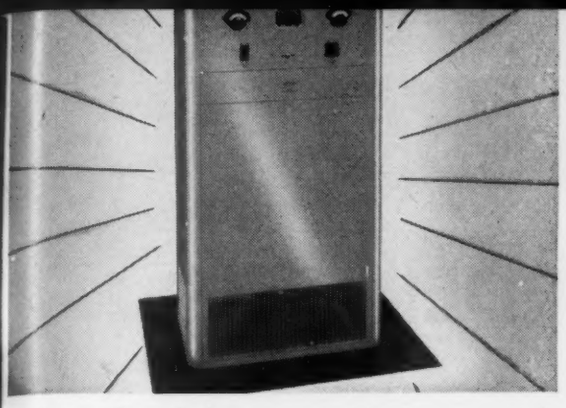
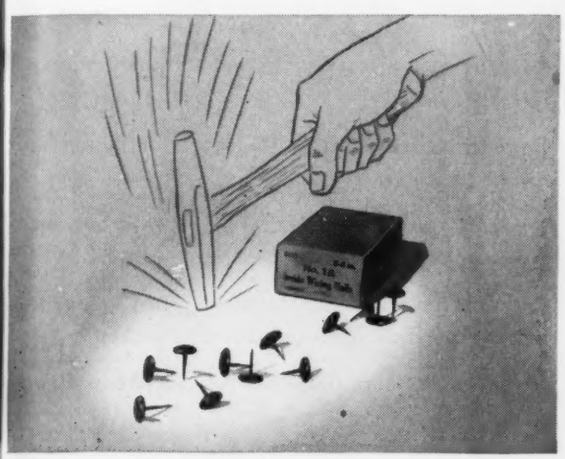
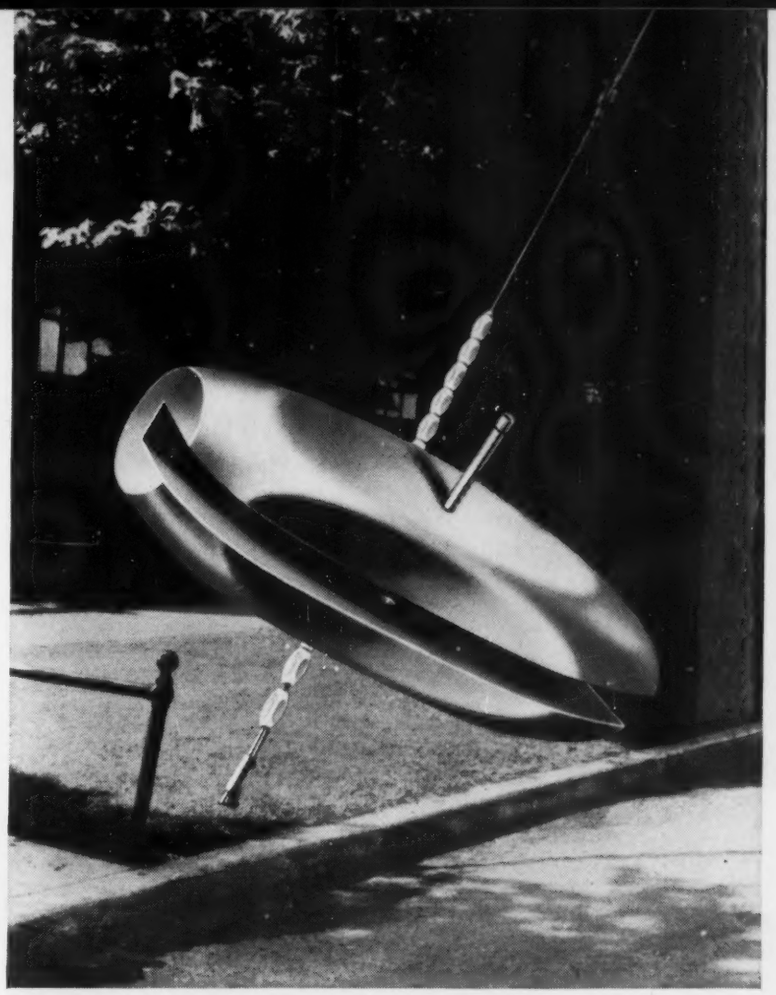
ALL OF THE ABOVE ITEMS MAY BE QUICKLY AND CONVENIENTLY ORDERED FROM



Continuous Power Savings are assured by this constant voltage battery charger. 4 Flctrol Chargers consume less standby power than 1 rotating type charger and will save on maintenance. Maintains close voltage regulation under heavy transient load conditions. Made by LORAIN PRODUCTS CORP.



Why Do It the Hard Way? Making neat installations is *easy*—with Rhodes Telephone Wiring Nails! Designed for telephone work—quality insured by rigorous driving, bending, withdrawing and immersion tests. Made by M. M. RHODES & SONS CO., in several colors and pin-lengths.



Get Maximum Guy Wire Protection at Lowest Cost with FLEXIBAL Guy Guards! They provide better protection, cost less at the start, and stay in first-class condition longer. Drive only one nail home and the guy guard is in place for years. Nail is already inserted in 6" spindle. These aluminum-coated wood guards are made by S. E. OVERTON CO.

t Delivery! Available now, for use with rn cable spinners, is Crapo Galvanized Lashing Wire. Heavily-galvanized; .091" .325" coils. "Stainless Steel" Lashing Wire " and 0.65" dia.) also shipped promptly. by INDIANA STEEL & WIRE CO.

MODERN CABLE SAVES MONEY 3 WAYS—Ansonia Ankoseal, the modern, all-plastic, lightweight cable costs less to buy in the popular sizes, costs less to install, costs less to maintain. Available for aerial, duct and direct burial use. Made by THE ANSONIA ELECTRICAL CO.

Time Proven! Creosoted Yellow Pine Poles supplied by Moss are selected for quality—expertly handled through seasoning and creosoting stages. Poles shipped as scheduled by purchaser. Look for the "Stamp of Character" on the poles manufactured by T. J. MOSS TIE COMPANY.

HAVE YOU PLACED YOUR ORDER FOR *Peatrophones?*

- PEATROPHONES offer the greatest opportunity for increased revenue from present subscribers since the advent of long lines:

1. It answers the telephone and delivers any message the subscriber wishes.
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3. Repeats all messages to the subscriber when he returns to the instrument.
4. Prevents "Don't Answers" as it always answers the telephone when the subscriber wishes.
5. Permits the subscriber to leave word when he leaves his office where he can be reached.
6. Is leased to subscribers by the telephone company.
7. So simple it can be operated by anyone who can operate a phonograph. Records can be kept and filed.
8. THE ANSWERING OR "TALK-OUT" MESSAGE IS MADE BY THE SUBSCRIBER ON THE PEATROPHONE AND AS IT REQUIRES LESS THAN ONE MINUTE TO MAKE, IS CHANGED BY THE SUBSCRIBER TO SUIT THE OCCASION.

FOR FURTHER INFORMATION WRITE

TELEPHONE ANSWERING AND RECORDING CORP.

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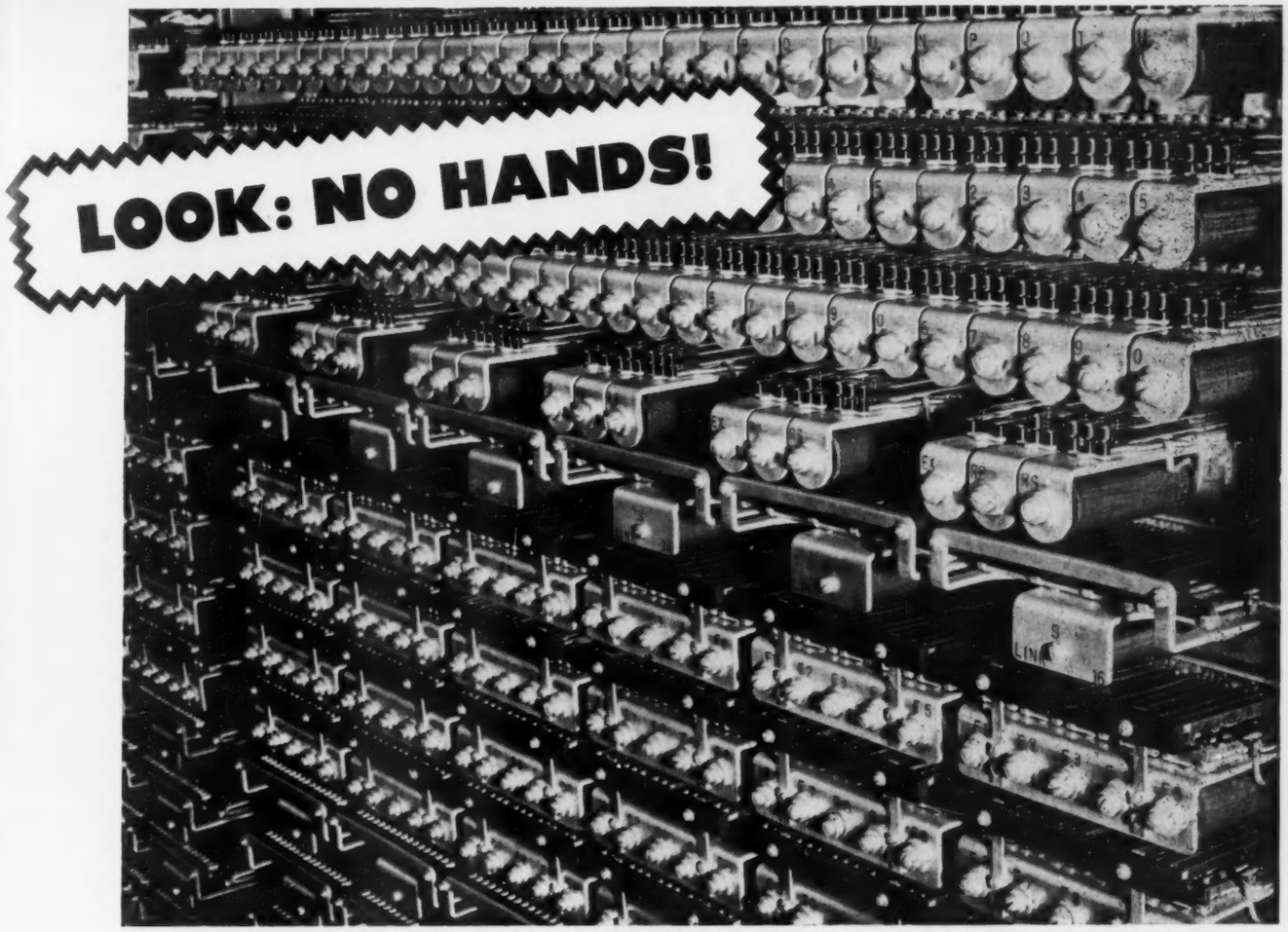


THERE is, of course, nothing new or surprising about a telephone switchboard unattended by operators. BUT! when we brag about "No Hands" we are referring to something *beyond* the mere handling of calls without manual aid. North "All-Relay" switchboards also serve year in and year out without extra "hands" for constant servicing. North friction-free, self-cleaning relays (and North boards are truly *ALL* Relay) provide uninterrupted switching with nothing more than occasional preventive maintenance.

You must see a North "All-Relay" exchange in action, look into its maintenance record, to appreciate how much you can save, how much better you can serve with North equipment. Let a North field engineer show you the facts on . . .

NORTH *"All Relay"* EXCHANGES

NORTH

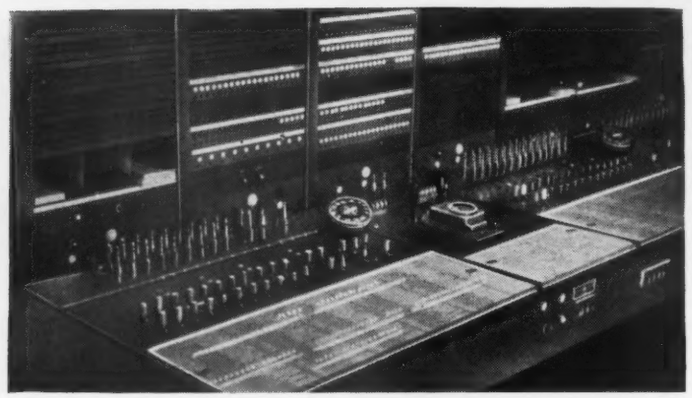
THE NORTH ELECTRIC MANUFACTURING COMPANY

Originators of **ALL RELAY** *Systems of Automatic Switching*

1430 South Market Street, Galion, Ohio, U.S.A.

CALCULAGRAPH ACCURACY!

...works for you in important cost-saving ways

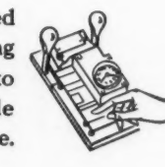


Photos courtesy of Automatic Electric

MODEL 33
FOR SWITCHBOARD
MOUNTING - OTHER
MODELS TO MEET EVERY
INSTALLATION NEED

AUTOMATICALLY FIGURES TOLL TIME! With Calculagraph on the job, there is no need for time-consuming, service-slowing manual figuring of elapsed time. Calculagraph does it all quicker, easier and, most important, with complete accuracy.

ACCURATE TO THE SECOND! Calculations are accurate down to the last second. Authoritative and indisputable, they make it possible to collect all the revenue due on every toll call — a basic advantage in exchanges large or small.



PERMANENT PRINTED RECORDS! Calculagraph prints elapsed time on permanent toll tickets which make accounting methods simpler, more efficient. Toll tickets are easy to read, remain legible permanently and are available for reference at any time.

COMPLETE INFORMATION ON AUTOMATIC TOLL TIME CALCULATING AND RECORDING IS CONTAINED IN THE CALCULAGRAPH FILE CATALOGS . . . WRITE TODAY.

THE STANDARD OF ACCURACY SINCE 1892

CALCULAGRAPH COMPANY
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Please send copy of the new catalogs on automatic toll time calculating and recording.

NAME_____ TITLE_____

COMPANY_____

STREET_____

CITY_____ ZONE_____ STATE_____

FITZGERALD, GEORGIA

Converts to *Federal* Step-by-Step

Southeastern Telephone Company's exchange in Georgia's "Colony City" now served by a 1,500-line and 1,800-terminal Federal Step-by-Step Dial Switching System.

At midnight, March 24, Southeastern Telephone Company, an affiliate of Central Telephone Company, took another important step forward under its program of modernization and expansion by converting Fitzgerald from manual operation to Federal Step-by-Step switching equipment. The full-sweep cutover was completed in split-second fashion in the company's new exchange building—one of the industry's most efficiently-designed structures. Included in the new installation is a 5-position Federal toll board.

Fitzgerald's cutover is the fourth exchange of the Southeastern Telephone Company to install Federal dial switching equipment—others being McRae and Montezuma, Georgia, and Tallahassee, Florida.

At the Fitzgerald cutover—left to right: Ed McKee, Sr., Central Office Engineer, Southeastern Telephone Company; G. J. Brims, Federal Telephone and Radio Corporation; W. C. Martin, Georgia Manager of Southeastern; Mayor J. C. McDonald, of Fitzgerald; Col. L. D. Densmore, Vice-President and General Manager, Central Telephone Co.

Partial view of 1,500-line Federal Step-by-Step installation at Fitzgerald, Georgia.

Federal offers advantageous prices and attractive delivery dates on its complete line of telephone equipment, including: dial switching systems; intercept, information, toll, repair, service observation, attendants, and toll test boards and desks; dial speed and traffic sets; telephone instruments; repeaters; carrier systems.

The new home of Fitzgerald's telephone service is one of the most modern and best-constructed buildings in the industry.

Whether your need is for a complete system or for equipment to interwork with existing exchange facilities, write Telephone Sales Department—

Federal Telephone and Radio Corporation

An IT&T Associate

100 KINGSLAND ROAD, CLIFTON, NEW JERSEY

In Canada: Federal Electric Manufacturing Company, Ltd., Montreal, P.Q.

Export Distributors: International Standard Electric Corp., 67 Broad St., N.Y.

Simple Arithmetic Proves

You Can't Beat Creosote Oil* as a Preservative

***Especially U·S·S CREOSOTE OIL**

Divide the total initial cost of a pole treated with creosote oil by the years of service life you can expect. Then apply the same formula to an untreated pole, or to a pole treated with a less-permanent preservative.

Your figures will prove that the annual charge for creosoted poles is much *less* . . . the many extra years of service far offset the cost of creosote oil treatment. Translate these figures into practice and you'll trim your annual pole replacement costs sharply for years to come.

But, for best results and lowest costs, be sure that U·S·S Creosote Oil is used. Its uniform quality, the result of *continuous* processing, makes it possible for you to obtain the same high performance, application after application.

If you are interested in more information, please write to the nearest sales office listed below. There is no obligation.

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EDITORIAL

Men Wanted!

THE INDEPENDENT telephone industry needs many more young men who are prepared to make the telephone business their life work. That need has become more acute with the rapid expansion of the business since World War II.

Particularly, at present, the need is for young men who are either technically trained or who are technically inclined and can be trained on the job in some phase of the business.

There are some categories, such as that of engineer, in which the backing of a diploma is usually considered requisite. But there are a number of categories in which on-the-job, actual, practical experience can develop the highest type of capability. In fact, on-the-job training is in many cases the only kind of training available in various important departments of the business.

Such categories include traffic men, plant men, construction men, commercial and management people, accountants, and so on.

The need we have most in mind is not so much the current as it is the long-pull need of the business.

At present the normal flow of young men into industry and other pursuits is upset by the needs of the military and defense production for manpower. But the presumption is that, barring world war, this artificial situation will level off in a couple of years, with young men returning to civilian life as other young men take their places in the military establishment. There may then be universal military training, an effect of which will be to retard the time when the young man is ready to take his place in civilian work.

The real point to all this, so far as the Independent telephone industry is concerned, is that, we think, Independent telephone companies and the Independent industry at large—via its associations and in other ways—should give thought to and make plans for bringing capable young men into the business for the long pull and as rapidly as the business can assimilate them. Because they will certainly be needed in the business as time goes on.

There are many young men to whom the Independent telephone business will appeal. They will prefer to be an individualistic part of a relatively smaller business, than to be in organizations, such as the many large businesses in various lines in the country, which are so vast that relations with most of their people must of necessity be highly impersonal.

The Independent telephone business is a good business for such men—as has been proven many times over by the experiences of many men in it.

The need, it seems to us, is to introduce the business to many young men who would find it the kind of business they would like to be in, and who would be valuable additions to it.

There is another angle to this situation which goes so nearly without saying that we do not need to dwell upon it in detail. Obviously, if the Independent telephone industry is to attract or keep capable young men, the pay it offers must be adequate, and comparable with that elsewhere for similar work and talents. The same goes for working and other conditions of the employment.

Judging by the tremendous demand during the past several years for more and more telephone service—a demand which seems to continue unabated—it is a reasonable assumption that the telephone business will continue to expand. There will be some temporary slow-down of growth during the national mobilization period, but that will likely pile up even a higher demand for telephone service as soon as it becomes available. For many years, probably—barring another world war—the telephone business will have to expand.

It is not too soon, it seems to us, to be thinking about the expansion of personnel as well as of plant. Because the former will be just as vital to the business as the latter.

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Stromberg-Carlson's PB

No. 120 Switchboard

Its handsome walnut cabinet, with sun-tan face mounting, dark plugboard and polished brass fittings instantly say, "This is a modern business!" It connects to either Manual or Dial exchange. Characteristic of its many features are cord splitting — instantaneous Busy Trunk indication, Reverting Tone, Toll Recall, Conference Circuit. Capacity, 80 lines.

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Factory, General Offices: Rochester 3, N.Y. Branch Offices: Atlanta 3, Chicago 6, Kansas City 8, San Francisco 3. In Canada: Stromberg-Carlson Co. Ltd., Toronto

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Switchboard Policy...

) make switchboards that are both the ıost serviceable and the most attractive

No. 121 Cordless Switchboard

Recommended wherever a business can be served by a part-time operator, dividing her duties with clerical or secretarial work. Connects to Manual or Dial exchange, with operator or station dialing. Provides through or non-through supervision . . . instantaneous Busy . . . and Common Talking, enabling the operator to answer another call when all connecting circuits are in use. 2 stock standards: 16 lines, 5 trunks, 5 connectors . . . and 12 lines, 3 trunks, 5 connectors.

STRI ERCOMMUNICATION SYSTEMS · TELEVISION, FM RADIOS AND RADIO-PHONOGRAPHS

I'm conducting a little research on my own and have pretty much convinced myself that there is only one scientific way to attach either twisted pair or parallel wire to pole or building. Notice how this line swings freely at the tie — certainly insurance of the longest wire life possible under any system. I've also noticed that all wear is on the hardware and that there are no sharp bends in the insulation — both mighty important features. We can cut the wire to accurate length after sagging, eliminating waste. The "P" Clamp does not require threading — it's easy and quick to install.

Also, have you noticed the large clamping area, and how it grips without distorting or damaging the wire even though the wedge design of this clamp tightens its hold as tension increases? I'm told this "P" Clamp holds telephone drop wire — twisted or parallel — braid, plastic or neoprene covered. Yes, Sir — I'm convinced the "P" Clamp is here to stay.

Standardizing on it would save us a lot of time and money, Boss — what do you think?

RELIABLE ELECTRIC COMPANY
3145 Carroll Avenue Chicago 12, Illinois

Reliable

Telephone Protective and Terminal Equipment for All Station, Line and Central Office Needs.

CATALOG NO.	CABLE	RANGE OF CLAMP MAX.	MIN.	WIDTH	BAIL LENGTH
P	Twisted Pair or Parallel	.160"	.140"	.250"	4"

STD. PKG.	SHIPPING WT. LBS. PER C
25	14

Steel Drive Hooks, Hot Dipped Galvanized — 7/16" Dia., 5-1/4" Long

OVER 40 YEARS SERVICE TO THE TELEPHONE INDUSTRY

Washington Bureau Reports

By Roland Davies and Fred Henck

L. W. Hill appointed director, Communications Equipment Division, National Production Authority . . . FCC & NARUC discuss revised separations manual . . . FCC reports recorder users are not using "beep" tone warning device.

THE INDEPENDENT telephone industry, which always has contributed much to the nation, both in service and in personnel, in times of crisis, now has another of its officials serving in a key position in the nation's defense mobilization machinery.

President L. W. Hill of the Carolina Telephone & Telegraph Co., Tarboro, N. C., has assumed his new duties as Director of the Communications Equipment Division of the National Production Authority.

Mr. Hill's appointment came about, it is understood, after the NPA top command decided that it would be necessary to have a man completely experienced in communications in the post. No one fits that description better than "Luke" Hill.

In a telephone industry career of 35 years, one of the high points of Mr. Hill's service has been his work —particularly important in his new NPA capacity—as General Coordinator of National Defense Activities in the eight-state area of the Southern Bell Telephone & Telegraph Co.

The South, of course, is and has been in the past one of the key national defense areas. In addition to its tremendous growth in war production facilities during World War II, there were a multitude of armed services' bases, Tennessee Valley Authority operations, and key agricultural production centers. Mr. Hill, who had been serving as Inventory and Costs Engineer of Southern Bell, was first named to coordinate defense activities in 1939, when the European war started, as an additional duty. As the defense program began to gain momentum, he was named to the defense coordination post as a full-time assignment, and continued in it until 1943, when he joined Carolina Tel. & Tel. as Vice President.

Mr. Hill became President of Carolina Tel. & Tel., as well as its subsidiary, the Home Telephone & Telegraph Co. of Virginia, in 1945, succeeding the veteran J. R. Porter. Both companies have had impressive records of growth and service in the postwar years, under Mr. Hill's administration.

Mr. Hill has been active in the U. S. Independent Telephone Association, serving as a Director since 1945, and on the Executive Committee for a three-year period.

As Mr. Hill entered NPA service, another telephone man, Glen Ireland, returned to his post as Vice President and General Manager of the Pacific Telephone & Telegraph Co's northern California-Nevada area. Mr. Ireland has been serving as NPA Assistant Administrator, and is credited with some of the most important work in the formulation of the agency's earlier programs and policies.

Coming Conventions

Ohio Independent Telephone Association, Deshler-Wallick Hotel, Columbus, Apr. 23-25.

Pennsylvania Independent Telephone Association, Abraham Lincoln Hotel, Reading, Apr. 30 and May 1.

Indiana Telephone Association, Claypool Hotel, Indianapolis, May 9-10.

United States Independent Telephone Association, Executives' Conference, Greenbrier Hotel, White Sulphur Springs, West Virginia, May 14-15.

Kansas Telephone Association, Kansan Hotel, Topeka. (Note change in location). May 22-23.

New York State Telephone Association, Mark Twain Hotel, Elmira, June 6-7.

California Independent Telephone Association, Palace Hotel, San Francisco, June 7-8.

Washington Independent Telephone Association and Oregon Independent Telephone Association, Hotel Multomah, Portland, June 15-16.

Tennessee Independent Telephone Association, Sept. 19-20, Nashville.

Arkansas Telephone Association, Hotel Majestic, Hot Springs, Sept. 24-25.

FCC & NARUC Discuss Revised Separations Manual

ALTHOUGH important staff members of the Federal Communications Commission and the National Association of Railroad and Utilities Commissioners have met for a full week in an effort to iron out their separations differences, and to attempt to start the ball rolling toward a revised separations manual, there was nothing of a concrete nature to report as TELEPHONE ENGINEER & MANAGEMENT went to press.

At the end of the week's sessions, the staff group said it had made no finalized decisions. It was decided, however, to submit a report on the progress to date to the NARUC Telephone Commissioners' Committee, headed by Georgia Chairman and Matt L. McWhorter, and the FCC, with its telephone activities directed by Vice Chairman Paul A. Walker.

Four subcommittees were set up

(*Please turn to page* 79)

Installer is being sure to cut off the drop wire at just the right length. The small amounts that can be saved on each job amount to many tons of copper.—(Ohio Bell Photo.)

Installer is splicing a small piece of drop wire to his new reel, demonstrating one way to save copper by using wire efficiently.—(Ohio Bell Photo.)

Modern Drop Wire And Cable Maintenance & Construction Methods

Conservation of existing plant equipment and stretching of limited available supplies to meet critical needs is an important part of the Company's maintenance program. Procedures described in this article will aid conservation of existing drop wire and cable plant.

By John S. Reed

AS THE RESULT of increasing military and defense needs coupled with a steadily rising demand from the public for telephone service, telephone operating companies are experiencing delays in the delivery of equipment and materials ordered for expansion of service and for maintenance of telephone plant. Conservation of existing plant equipment and the stretching of limited available supplies to meet critical needs is thus becoming an important part of the company's maintenance program.

Since cable plant expansion is seriously retarded by a shortage of lead and copper, and drop wire is a short-lived item of plant, this article is concerned with maintenance procedures that will conserve existing drop wire and cable plant and make the best use of available materials used in outside plant.

Increase In Drop Wire Life

AS WAS JUST pointed out, the type of drop wire in common use is a short lived item of plant material, making it very expensive in comparison to other and more durable items in the group. In the case of one large operating company, drop wire constitutes but 3½ per cent of the total value of its plant, yet accounts for 10 per cent of its maintenance expense.

This high maintenance cost is due to the fact that a cotton braid is used over rubber insulated conductors of the commonly utilized drop wire, which has a low resistance to weathering effects, and to the fact that this wire is subjected to abrasion of the insulation in various ways. Although the braid is protected by asphalt sat-

urants and a coating of mica flakes, it is easily weakened by exposure to sunlight and fungi attacks. When the braid is worn off by abrasion, or weathered away, the rubber insolation deteriorates as the result of exposure to sunlight and ozone. This causes the rubber to harden and form fine cracks through which moisture seeps.

In magneto exchanges, the loss of braid protection and the deterioration of the rubber insulation has little or no effect on the quality of service, due to the fact that there is no direct current flow in the conductors. Trouble actually occurs only when the conductors become short circuited or grounded as the result of the final disintegration of the rubber covering which exposes the conductors. In common battery and dial exchanges, however, the central office battery voltage which is present on the conductors at all times forces a small current flow over the paths resulting from moisture entering the cracks in the rubber insulation after the braid covering falls away. This small current flow results in corrosion of the metal conductors. In humid regions, this corrosion is very rapid and the drop wire fails within two or three years.

Within recent years an important change has taken place in the insulation characteristics of drop wire. The cotton braid and rubber insulation has given way to a jacket of neoprene over a special high quality rubber insulation or to a solid extrusion of polyethylene over the conductors. These compounds are not affected by weathering and are very resistant to abrasion. Tests conducted by Bell wire development engineers indicate that neoprene jacketed wire with cotton reinforcement between an 0.04 inch thick jacket and the inner rubber insulation may have a life of 20 years under severe climatic conditions. (The purpose of the cotton reinforcement is to cushion the wire against crushing pressures in drop wire clamps when the wire is subjected to heavy loads approaching the breaking strength of the wire. In addition, the cotton layer enables the jacket to be stripped off the rubber insulation, leaving the latter intact around the conductors.)

Although the neoprene drop wire will resist abrasion by small branches and twigs whipping against the wire, large tree limbs bearing against the wire with pressure will gradually wear away the covering. For this reason, drop wire should be strung to avoid tight contacts with tree limbs or swaying objects and plastic wire guards should be placed on the wire at the points of rubbing contact which cannot be avoided either at present or in the future.

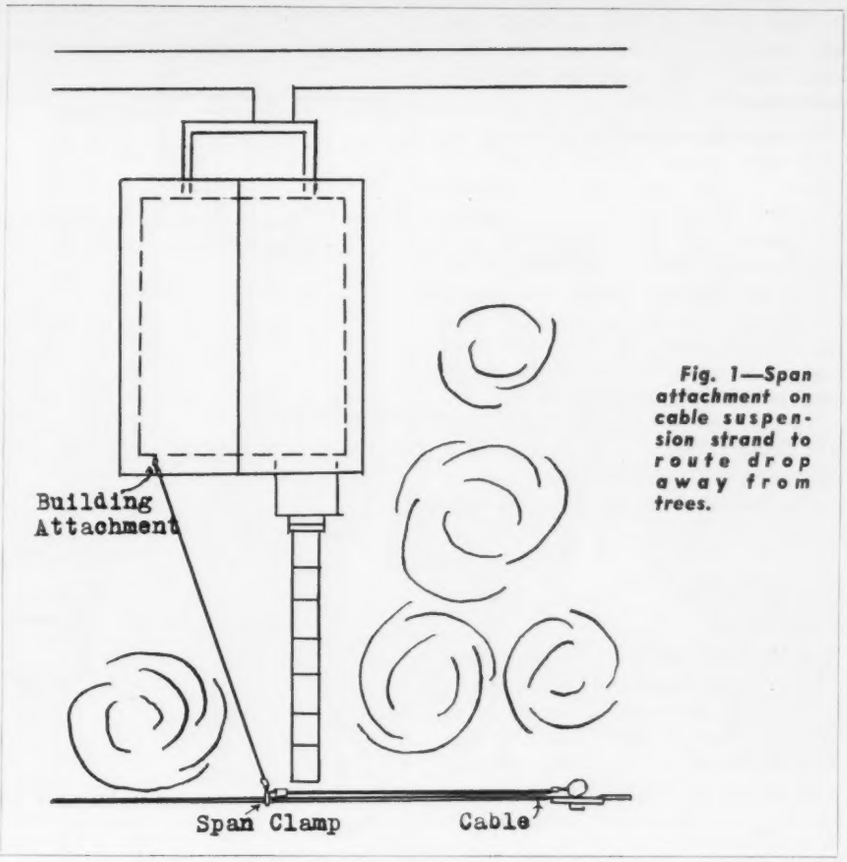

Fig. 1—Span attachment on cable suspension strand to route drop away from trees.

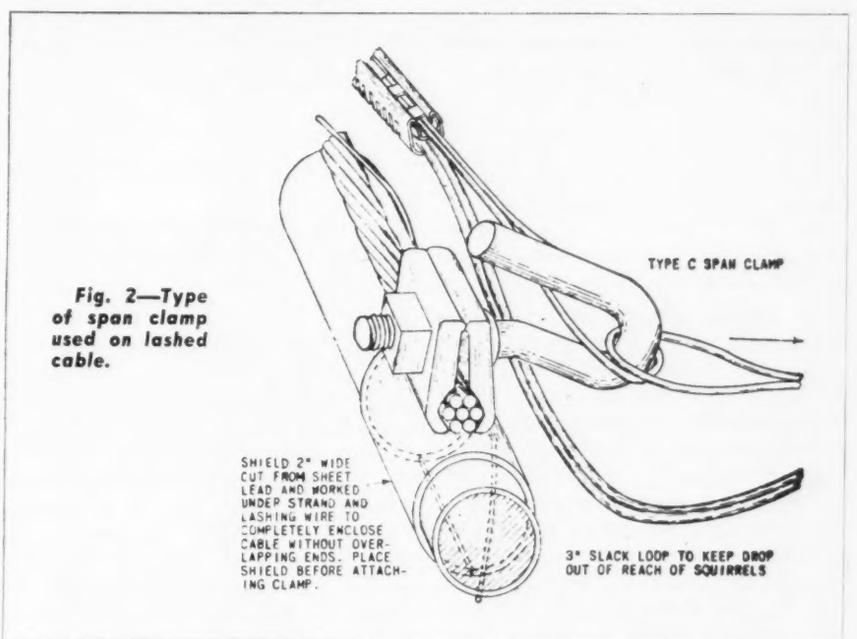
TYPE C SPAN CLAMP
SHIELD 2" WIDE CUT FROM SHEET LEAD AND WORKED UNDER STRAND AND LASHING WIRE TO COMPLETELY ENCLOSE CABLE WITHOUT OVERLAPPING ENDS. PLACE SHIELD BEFORE ATTACHING CLAMP.
3" SLACK LOOP TO KEEP DROP OUT OF REACH OF SQUIRRELS

Fig. 2—Type of span clamp used on lashed cable.

The toughness of the new types of wire coating has made it necessary to develop special strippers for separating the conductors in splicing and connecting the wires. In the case of neoprene jacketed wires, the slitting of the jacket exposes the rubber insulation on the conductors, requiring wrapping of the conductors with friction tape to protect the sensitive insulation. To overcome this objection, drop wire with rubber insulation and neoprene jacket over the separate conductors has been developed, the two separately covered wires being joined by a tough fin of neoprene. This drop wire has a cross section resembling that of a dumb-bell; hence the term commonly applied to this wire, "dumb-bell pattern drop wire". The wire can be divided by cutting the

fin with a slitting tool available for this purpose. This leaves the side walls intact and prevents exposing the rubber insulation.

Another step in the improvement of drop wire characteristics is the reduction of the conductors size from No. 17 to No. 18 gauge. This reduces the cost of the wire somewhat and also decreases the over-dimensions of the wire, without greatly impairing the strength of the conductors. The use of copper-steel for the conductors is also increasing, since No. 18 gauge copper-steel is equivalent to No. 17 gauge bronze in breaking strength and is claimed to have somewhat greater resistance to crystallization under conditions of vibration at span supports.

Protection Of Drop Wires

METHODS OF preventing drop wire failures are directed chiefly to avoiding abrasion of the wires on trees or other obstructions. The simplest method of avoiding contact with trees and shrubbery is to route the drop wires around these obstructions. There are several ways of routing the wires as follows:

(1) Attaching the wire to cable suspension strand in a location where the wire will clear the trees in spanning to the building attachment as shown in *Figure* 1. A span clamp such as the type shown in *Figure* 2 is used for this purpose. In certain cases it is possible to string the drop across a residence driveway from a span attachment so as to obtain permanent clearance from trees.

(2) Running the drop to another pole than the terminal pole in the same cable lead or to another pole across the street and then to the building attachment. In the latter case, it may be necessary to obtain a permit to make the attachment if a foreign pole is involved. A small drop pole (Class 10) may be placed if necessary to properly route the wire and obtain the proper ground clearance for the run. In rural districts, more than one pole may be placed if needed. The wire run, however, should not exceed 500 feet in length for good economy; otherwise, an open wire spur on brackets should be placed.

(3) Locating the drop span attachment on the terminal pole at a point lower down the pole to run the wire under the lowest branches of the interfering trees. This can be done only if ground clearances are not reduced below the minimum prescribed for the crossing situation.

(4) Attaching the building end of the span at a different location on the building than the one that would have ordinarily been selected, in order to clear the interfering trees or shrubs. This method is illustrated in *Figure* 3.

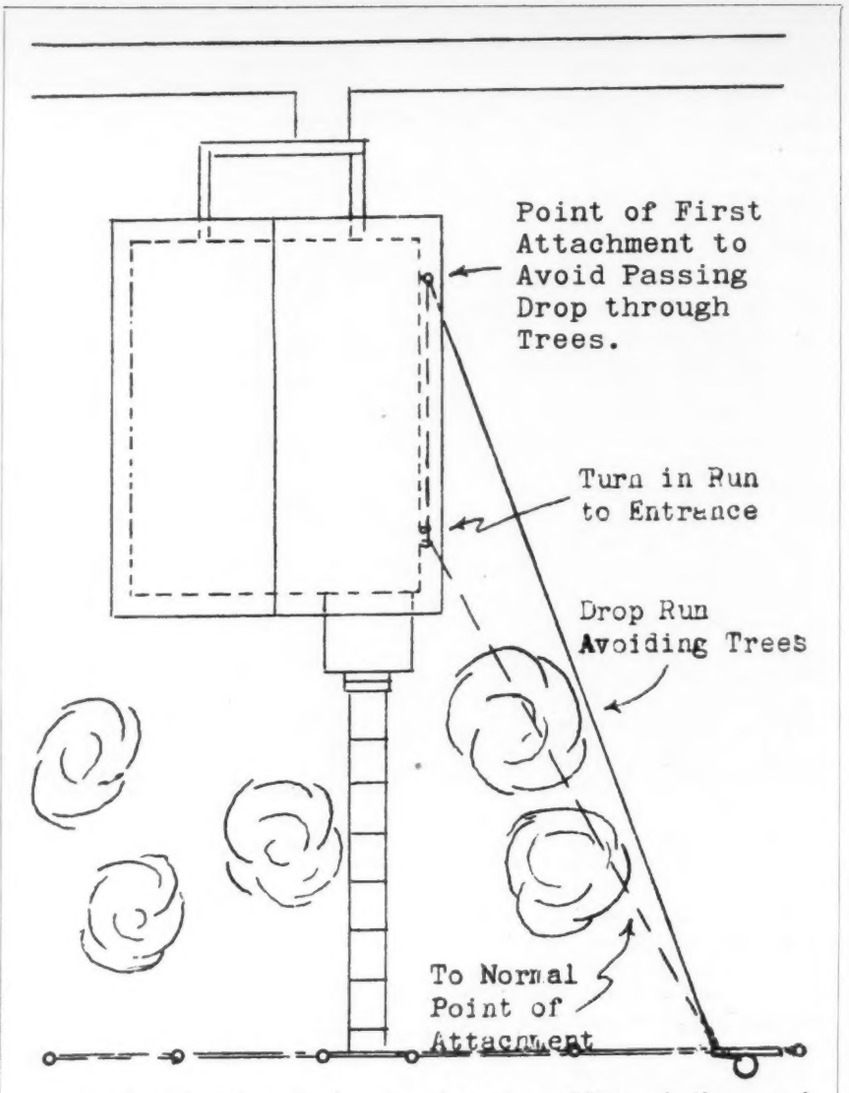
Point of First Attachment to Avoid Passing Drop through Trees.
Turn in Run to Entrance
Drop Run Avoiding Trees
To Normal Point of Attachment

Fig. 3—Relocating attachment on house to avoid trees in the way of the drop wire span.

(5) Attaching the drop span to an adjacent building (or to a garage on the subscriber's premises) and then bringing the drop to the subscriber's residence as indicated in *Figure* 4. Attachment to an adjacent building will require permission from the owner of the building.

In routing the drop, effort should be made to obtain sufficient clearance from trees for at least several years. When routing the drop will not result in the desired clearances, permission should be obtained from the subscriber to trim the trees that are in the way. In trimming trees for drop clearance, the following points should be kept in mind:

(1) Subscriber good will should be retained by careful trimming of the trees, by avoiding property damage, and by taking away branches and foliage removed from the trees. Care in these respects will pay dividends in satisfactory relations with the subscriber, and, in addition, no time is lost, since it is no more difficult to do a conscientious, workmanlike job of trimming than to cut off branches here and there without regard for the appearance and welfare of the tree.

(2) Branches should be cut back sufficiently to obtain at least three years clearance for the drop wire span. Small branches and twigs should be removed as well as larger branches in obtaining the proper clearance, as the smaller tree appendages can cause trouble by whipping against the wire. Resprouting of the branches can be minimized by cutting off branches growing in the direction of the drop wire, flush with the tree trunk or limb, and leaving

intact other branches growing away from the wire.

(3) Trees should be undertrimmed, if possible, so that the drop wire will pass under the branches, since branches tend to grow up and out, rather than down. If the trimming is being done in the winter season, the clearance should be increased to compensate for the branches bending under the weight of the foliage when the tree comes into full leaf in warm weather. Side trimming may be resorted to, if necessary, but care should be taken not to upset the symmetry of the tree, if this would be objectionable to the subscriber. It is undesirable to top trees for drop clearance, and this method should be avoided if there are other practicable ways of obtaining the desired clearance, or if the drop wire can be protected with wire guards.

If it is not possible to obtain the desired amount of clearance, the trees may be trimmed to the extent permitted, and then drop wire guards may be placed for protecting the drop wire.

When other methods of preventing drop wire abrasion through contact with trees, swaying objects, and telephone pole guys are not practicable, plastic wire guards may be installed as illustrated in *Figure* 5.

The type of plastic guard commonly used for this purpose is a ½″ diameter plastic tube with 3/64″ wall. This tube is split spirally along its length to enable the guard to be spiraled around the wire. Long lengths of this tubing are available, but the most satisfactory results are obtained with the use of 36″ straight lengths, as it is difficult to place long lengths of tubing on drop wire.

To install the guard, a notch is first cut in one end of the guard at an angle to facilitate slipping the guard onto the wire. The notched end is then pushed against the wire to bring the wire inside the first spiral at the end of the tube. Both hands are then employed to completely twist the guard onto the wire. In some cases, it is possible to pull the guard along the wire after the first few turns, causing the outside length to rotate into position around the wire. This pulling method is much faster than the wrapping procedure; however, the successful use of the method depends on the way the spiral slit is cut by the manufacturer.

In placing the short lengths of guards, as many of the plastic tubes should be installed as required to protect the drop wire through the trees plus an additional three feet on each side of the interfering area to protect against additional growth of the tree foliage for a reasonable period of time.

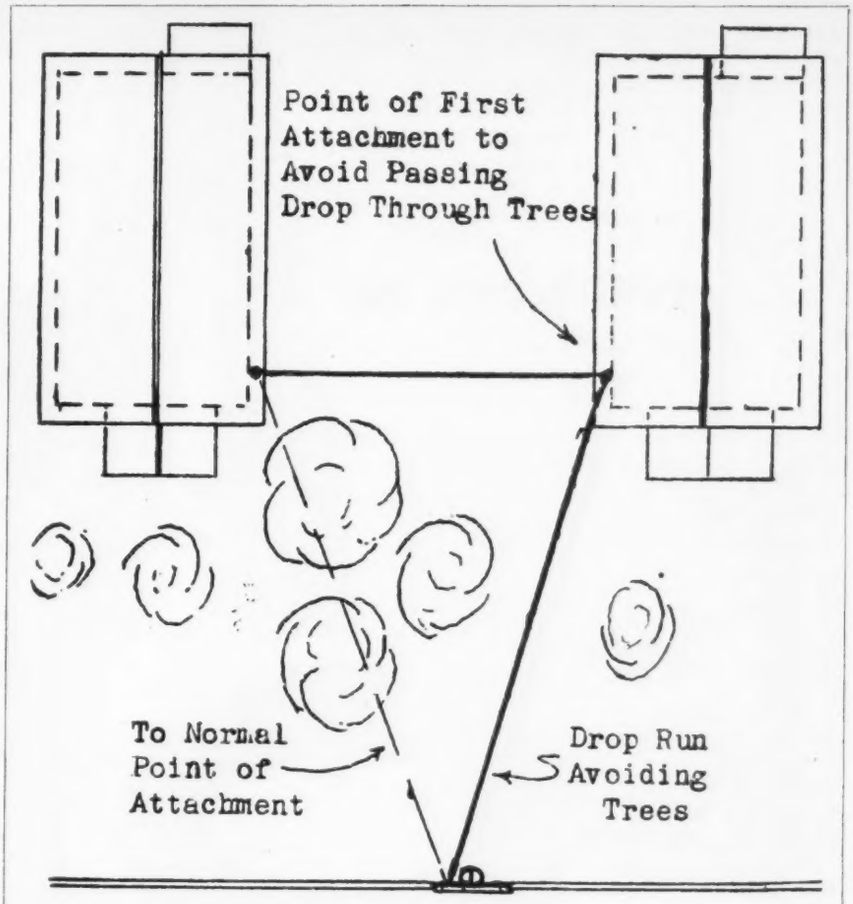

Fig. 4—Attaching drop wire span to another house to avoid trees in the way.

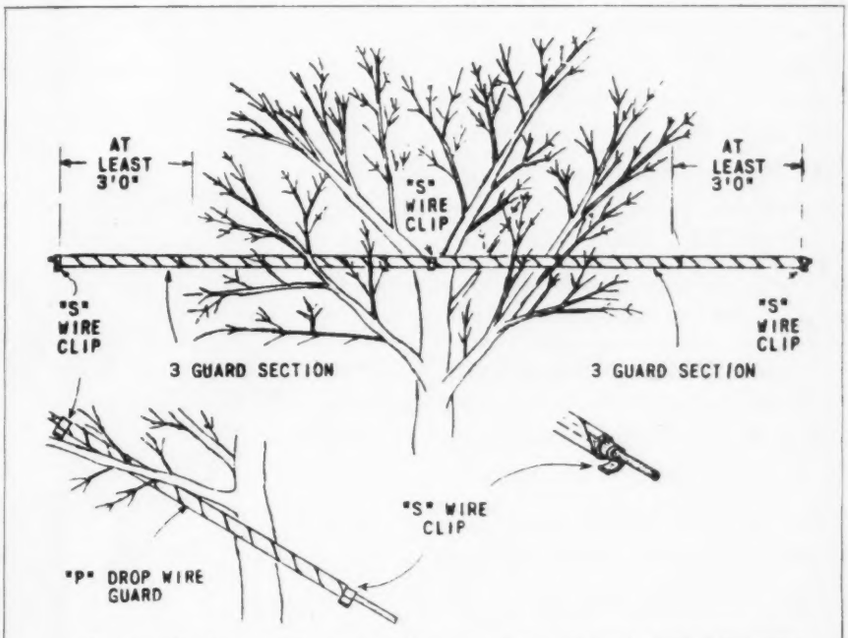

Fig. 5—Placing plastic drop wire guards to protect drop wire passing through trees.

In some situations it is possible to avoid the troublesome work of trimming trees, routing the drop wire spans, and protecting the wires where needed by placing additional cable terminals on poles between existing terminals in the lead. The extra ter-

(*Please turn to page* 35)

EVERY COIL OF Alphaduct

DROP WIRE IS *WATER TANK TESTED BEFORE IT LEAVES THE FACTORY

You don't have to worry about insulation breakdown when you use Alphaduct drop wire. *Every* coil is tested by submersion in water for nine hours, after which an alternating potential of 1000 volts is maintained between each conductor and the surrounding water for at least five seconds. After this exacting test, every coil must have an insulation resistance of at least 3000 megohms per thousand feet.

Alphaduct is the longest wearing, most satisfactory drop wire you can use. Step-testing, during every phase of manufacture assures you your drops will last and last . . . . and last.

Every coil is dated, so you can easily check its performance for yourself. Moreover, it comes to you in Alphaduct's neat, handy carton packaging.

Alphaduct drop wire is available in twisted pair, parallel or dumbbell type, with bronze or Copperweld conductors. Try it.

ALPHADUCT WIRE AND CABLE COMPANY • MILLTOWN, NEW JERSEY

NATIONAL DISTRIBUTORS • LEICH SALES COPORATION, CHICAGO, ILLINOIS

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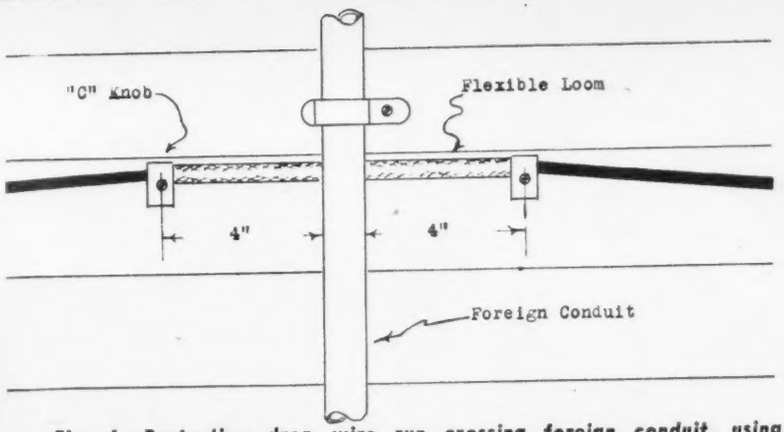


Fig. 6—Protecting drop wire run crossing foreign conduit, using flexible loom.

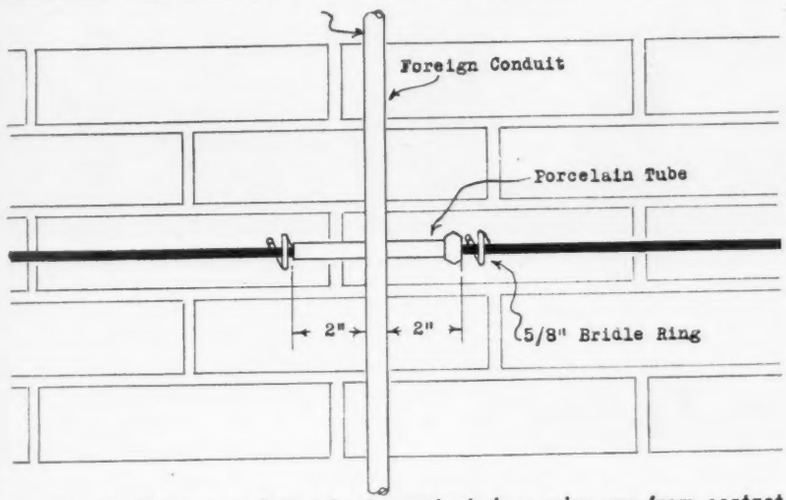


Fig. 7—Using porcelain tube to protect drop wire run from contact with foreign conduit.

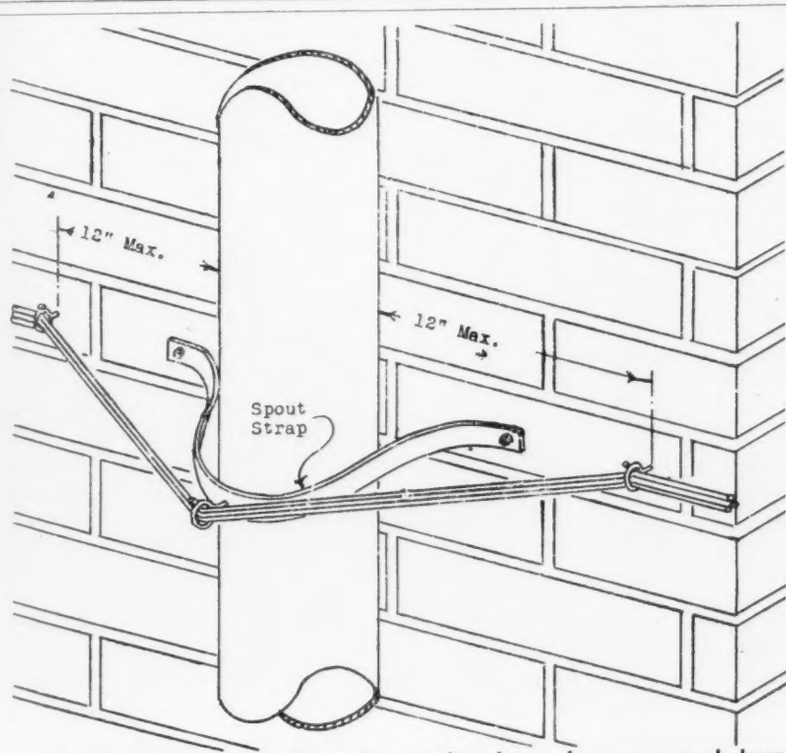


Fig. 8—Spout strap utilized for passing drop wire run around down spout.

minals will eliminate pole-to-pole wire runs through trees along streets or alleys and may avoid the need for placing span clamp attachments in some cases. This arrangement will greatly increase the flexibility of the cable feed by providing additional multiples, making it a simple matter to obtain reassignment to the proper terminal for any drop as required to obtain a routing as free as possible from interference by trees or shrubs.

Protecting Drop Wire Runs on Buildings

DROP WIRE runs on buildings are subject to abrasion on projections, or to damage by crosses with foreign circuits or by ice formations. Protection of these runs is accomplished by maintaining minimum clearances, or greater, from objects and foreign circuits, by taping the wire at the interfering points with rubber tape followed by friction tape, or by covering these places with flexible loom.

The wire should pass gutters, down spouts, iron conduit, radio and television leads with not less than 2 inches clearance when crossing, or 8 inches clearance when paralleling these objects. In the case of electric service wires passing near either a drop span or a building wire run, the minimum clearance is 4 inches when crossing or 8 inches when paralleling. Lightning rod wires must never be crossed by a wire run, though it may be paralleled by the run at a distance of not less than 6 feet. In locations where heavy ice formations are likely to occur, wire runs should be kept at least 2 feet away from down spouts. If a drop wire span passes under a gutter to its attachment on the building, the attachment should be placed high enough to lessen the force of icicles falling and striking the wire.

Wire runs that must cross the obstructions described in the foregoing paragraph with less than the minimum required clearances specified, excluding lightning rod wires, should be protected as illustrated in *Figures* 6 *and* 7. In the case of down spouts, a spout strap may be used as illustrated in *Figure* 8 to pass the drop run around it. Runs coming in contact with building projections, corners, overhangs, edges of deep window openings and the like may be protected by the methods shown in *Figures* 9 *and* 10. For drop wires already in place and not adequately protected a section of split loom may be placed on the wire and taped over with friction tape. Two layers of rubber tape

(Please turn to page 64)

Frances Hosford, New York Tel. Co. repair attendant at 208 E. 79th Street, New York City, answers a customer's call and removes his trouble history card from the files.

"MIOBA" Aids Day-To-Day Improvement of Telephone Service

New code word made up of letters representing measurements used in determining quality of plant service from the subscriber's viewpoint proves in as repair service helper.

By Myrle Shafer

Associate Editor,
Telephone Engineer Publications

IF YOU WORK in repair service, "*Mioba*" may be a mighty familiar word. If it isn't familiar, your first impulse may be to say: "*Oh, that's a new medicine*" or "*Sounds like something I studied in high school biology.*"

Fact is, the word is made up of some of the letters which represent codes for certain key service measurements used in determining quality of plant service—from the customer's viewpoint. These measurements are based on what the customer thinks and reports and are used in determining what is known as the Exchange Plant Maintenance and Installation Indexes.

According to TELEPHONE REVIEW, published by the New York Telephone Co., repeated reports or *M* reports (first letter of *Mioba*) are subscriber reports received within 30 days of a previously closed subscriber report from the same station or associated extension stations. Repeated reports therefore are a good measurement of the effectiveness of trouble testing, analysis and trouble clearing work.

Obviously a company is not giving very good service if a subscriber has to call twice within 30 days about trouble on the same telephone. Here again what the subscriber thinks, does or reports has quite a bearing on performance as all reports must be counted. For example, a subscriber in a dial exchange may leave his receiver off the hook. A subscriber report is received and the report is tested and closed on that date as a "receiver off hook."

Within 30 days the same subscriber may experience a delay in getting the dial tone due to the volume of calls going through the office at that particular time. He reports it and after testing and analysis it is cleared as a "test o.k. due to temporary overload of the equipment." While there was no defective or poorly maintained plant or equipment involved an *M* report must still be counted.

To obtain maximum points in this measurement the volume of these reports to initial subscriber reports must be two per cent or less.

Out-of-service reports are subscriber reports involving complete interruption of either incoming or out-

going service at any telephone. This includes situations where the main telephone is o.k., but service on the extension telephone associated with it is interrupted inward, outward or both ways. These are coded *O* (third letter of Mioba).

When an out-of-service report is termed carried over, that means it has not been cleared on the same day it was received. The category is further broken down into two groups: reports received between midnight and 5 p.m. (*B* reports, the fourth letter of Mioba); and those taken from 5 p.m. to midnight (*A* reports, the last letter of Mioba).

Another barometer of good service, the last of Exchange Plant Maintenance Indexes, is obtained by comparing the percentage of *B* reports, or those carried over that are received before 5 p.m., with *O* reports, or the total out-of-service reports. *A* reports (last letter of Mioba), or out-of-service reports carried over that are received from 5 p.m. to midnight of the previous day, while useful measurements to plant people, are not used in Exchange Plant Maintenance Index.

I (second letter of Mioba) reports or subscriber reports involve trouble on the subscriber's premises or to his drop wire received within 30 days of the date the service was installed.

Plant people of the New York Telephone Co. are constantly on the go trying to uncover ways to make the service to subscribers more reliable so that they'll have even less cause to report defects. The answer, say Plant men, is better maintenance—and here are the 10 ways used to achieve that goal:

(1) Central office equipment troubles are constantly being analyzed to fix the blame when trouble is reported even after sound corrective measures have been taken.

(2) By using a newly developed line insulation test, employees can track down tiny electrical flaws in cable plant before they affect subscribers' service. These tests are made as frequently as twice a week. New fault-locating sets known as "breakdown sets," are proving very helpful in locating and clearing these small faults.

(3) Wet weather line insulation tests using the same electronic test sets as are used in the insulation and fault-finding tests every time rain drenches the area. This way, bugs that may develop in the equipment, are squelched before the subscriber's service is jeopardized. The subscribers' defective drop wires are being replaced with the same promptness as if they were out-of-service reports.

(4) Testboard men are scrutinizing the tests they make even more closely so that they can nip the defect before it ever comes to the subscriber's notice.

Edward A. Davis, L. I. repairman, has been given necessary data on trouble complaint, checks line for possible short circuit.

(5) There is always a chance that plumbers, contractors, or other utilities may cut close to underground lines. To avoid the possibility of their gouging into a nest of underground or buried cable, the New York Telephone Co. furnishes them with data about these lines. When the service on the larger cables is interrupted, spot radio announcements, and sometimes personal visits are made to let subscribers know when their telephones will be back in shape and working for them. Reports slow down the smoothly flowing repair work that is set in motion whenever there is an interruption. Briefing the subscriber on the situation cuts down the number of these reports.

(6) Moisture is the natural enemy of the cable. If employees can find the chinks in the cable's armor before there is serious damage, many cable failures are averted. For this reason underground and aerial cables are checked frequently for cracks and other openings through which moisture might infiltrate.

(7) Whenever there's a visit to a subscriber's premises, whether to reconnect or change service, or to correct some reported trouble, all telephones and wiring are inspected and potential troubles such as worn cords, loose wiring, old-type fuses, loose connections, etc., are remedied.

(8) Chronic cases of receivers-off-the-hook are turned over to the commercial people. They are doing a splendid job of gaining the cooperation of customers in solving this problem.

(*Please turn to page* 74)

At test board above men test and analyze customer's trouble report originally received at the repair service desk. Code letter entered on the trouble history card by the repair attendant tells the tester what kind of report it is. This board serves five exchanges.

✓ Detect, ✓ Correct, ✓ Protect Lightning and further improve

By H. G. Turner

Assistant Vice President, Operating Department
Southern Bell Telephone & Telegraph Co.

IN THE OLD days, men believed that lightning was a bolt of fire hurled at the earth by an angry god. It is easily understood how they came upon this belief when we see the sky filled with blinding flashes and hear the crash and rumbling roll of thunder.

Positive and negative electric charges always attract each other. The question is, how does nature create these charges resulting in lightning.

How Lightning Is Created

THUNDER clouds are developed from moisture being carried up by rising air currents. The moisture condenses in the clouds forming rain drops. As the high speed air currents churn the rain drops up and down they become positively charged. At the same time, negative charges are created and are carried by the velocity of the air currents out into the main body of the cloud. The positive charged rain drops do not move away so easily—the small drops recombine and fall back, only to be broken up again with a still higher positive charge.

Lightning Discharge

AS THE negative charge builds up in the lower portion of the cloud, an equal positive charge is induced on the earth surface directly beneath the cloud. As the charged clouds are blown along, the positive charge on the ground moves directly below. Since these positive charges are attracted to the negative charges in the cloud, they will move up any conducting object, trees, buildings, church steeples and towers to get closer to the negative charge in the cloud. The separate charges grow stronger and stronger, sending down feelers or spurts until contact between the two is made, breaking down the air resistance and ionizing a path over which the high current flows.

Lightning is a high-speed flow of negative and positive electrical charges rushing together at terrific speed and of sufficient magnitude and heat to partially destroy the molecules of the air, ionizing a path over which a terrific flow of current passes from cloud to ground. All of this takes place in some millionths of a second. One of the new things recently learned about lightning is that it may also strike upward from the ground.

It is the terrific ionization causing the high speed flow of current that you see as the lightning flash.

The pressure resulting from the partial destruction of the molecules during the ionization period produces the thunder you hear.

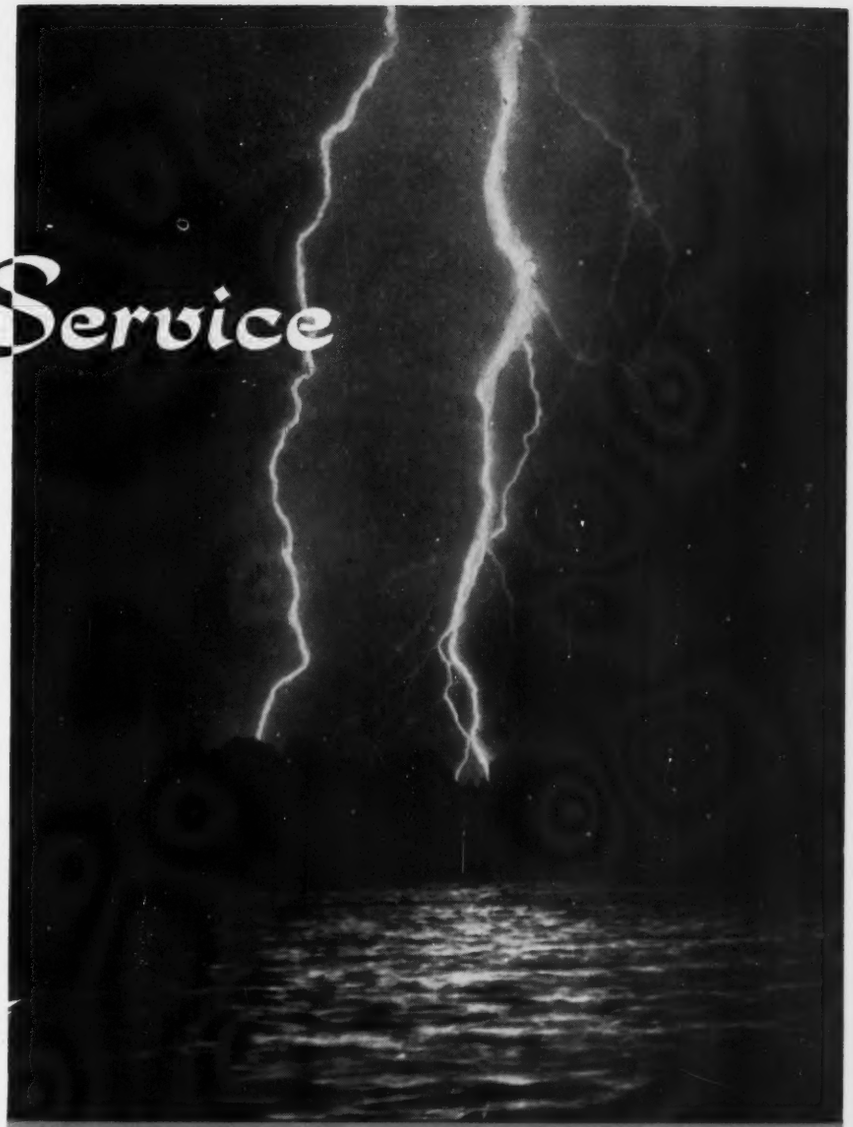
Lightning is very hot. Some strokes, at their peak, generate temperatures as high as 27,000 degrees Fahrenheit.

(All pictures courtesy of the General Electric Company)

POWER enough to supply a large city may be contained in a single lightning stroke. It is "turned on", however, for only about 35 millionths of a second. Chances of being hit by lightning in the United States are about one in 365,000. Approximately 400 people in this country are killed annually by lightning and around 1,500 injured.

Exchange Cable Maintenance

...to Customer Service



LIGHTNING is very hot. Some strokes at their peaks generate temperatures as high as 27,000 degrees, Fahrenheit. It is estimated that 100,000,000 tons of valuable nitrogen fertilizer, manufactured right out of the air by lightning, are deposited on the earth each year. One of the safest spots you can be during a lightning storm is in your car, if it's an all-steel closed model.

Lightning travels approximately the same speed as light—186,000 miles per second. Thunder, on the other hand, crawls along at 1100 feet per second—which is the speed of sound.

Cable Troubles Due to Lightning and Other Electrical Causes

IN 1949 THERE were 30,249 cable troubles in the large cities in Southern Bell. Of this number, 9,694 or 32.0 per cent were due to lightning and other electrical causes. *The cost to clear the trouble and repair the plant was approximately* $500,000. *This does not include the cost of replacement of plant, repairs to station equipment or the cost of repairmen's visits to clear station trouble.*

There are two general types of protective equipment:

(1) *Devices to limit abnormal current.* (*Fuses*).
Due to extremely high voltage and relative low current of lightning discharges, these devices are not normally designed to operate from a lightning protection standpoint. (Direct strokes).

(2) *Devices to limit voltages.*
Limitation of voltages is accomplished by means of protector blocks.

Protector blocks are an arrangement which provides a small air gap between conductors and ground. The protector block combinations provided for use are listed below:

Code Designation	Gap in *Mils	Aver. Operating Voltage	Color Code On Porcelain	Common Use
26-27	3	350	White	C.O. and Station Prot.
28-29	3	350	White	C.O. Protection
26-30	6	700	Blue	Cable Protection
26-31A	10	1000	Yellow	Special Application

*Thousandths of an inch.

Operating voltage means normally that any voltage greater than that shown for the protector block combinations will jump across the gap and flow to ground.

If the discharge is prolonged the heat produced will cause the blocks to become permanently grounded, resulting in the line being out of order.

The first line of defense in the battle against lightning is to construct and maintain the outside plant in such a way as to reduce the chances of contact with power wires, frequently resulting in power-arc follow-ups. This necessitates the use of standard practices in the design and construction, and is fundamental in the protection of telephone plant. Even with the best possible construction and maintenance procedures, occasional contacts with power circuits are unavoidable due to accidental circumstances.

General Means of Providing Lightning Reduction

THERE ARE three general means of providing a reduction of lightning trouble.

(1) Limiting voltage differences by connecting protector blocks between conductors and sheath at points where voltage differences are the highest and occur most frequently.

(2) Providing means of diverting from the cable a significant part of the current brought in over open lines.

(3) Providing conductors in parallel with the sheath to increase its conductivity and

(*Continued on next page*)

Lightning (Cont'd)

thus reduce the voltage difference between pairs and sheath.

Each of these procedures has its field of application depending on particular circumstances. Frequently they may be used together. *The following is a list of standard protective measures that are provided to reduce lightning troubles*:

(1) Protector Blocks
   (a) On working pairs at open wire and cable junctions.
   (b) On large groups of pairs not distributed at the junction of cable and open wire.
   (c) On all pairs, spare or working, at junctions of cable and open wire.
   (d) At certain drop wire locations.

(2) Ground Sheath at Junction of Cable and Open Wire.

(3) Protection on Open Wire Ahead of Cable.

Field of Use of Protective Measures

EXPERIENCE shows that the factors affecting the rate of lightning damage on existing exchange cables vary over a wide range, even within relatively small areas. Due to these facts, it is not possible to prescribe how much protection is required on a general basis without running the risk of getting into the plant far more protection than may be required.

In the case of existing plant the question as to the need for additional protection in particular areas or on particular cables can be accurately determined only by a review of past trouble occurrences.

Make Lightning Study

IN ORDER to proceed with proper lightning protection and trouble reduction on an effective and economical basis, it is necessary that a study of lightning troubles be made in each location where the troubles most frequently occur. This study should show the approximate location of each trouble on a city map, so that it can be determined which areas are being adversely affected. As soon as the results have been thoroughly analyzed, one or more of the above corrective measures should be instituted.

The expanding use of rural open wire and cable will further increase the chances of lightning damage unless proper protection is provided.

The idea that little can be done to reduce the trouble caused by lightning is a fallacy. *Damage from lightning is often due to failure to provide known protection before the lightning season hits. Now is the time to take corrective action.* It has been proven that where corrective action has been taken in accordance with standard practices, lightning troubles and damage to telephone plant have been materially reduced.

With the gathering war clouds, increased costs and a growing scarcity of materials it is every employee's patriotic duty to make a special effort to properly protect equipment and conserve supplies. Dependable communications are vital in the present emergency as never before in the nation's history.—(*Appreciation is expressed to Engineer J. H. Hagenguth, high voltage engineering laboratory, General Electric Company, to the National Geographic Society for technical and scientific information used in connection with this article, and to C. S. Bolen, editor of* SOUTHERN TELEPHONE NEWS *for permitting reproduction of this article.*)—THE END.

THE EARTH, as a whole, has some 44,000 lightning storms every day and 100 lightning flashes every second. Lightning does strike not only twice but many times in the same place. It has hit the Empire State Building in New York (shown here) as many as 12 times in 20 minutes.

1,800 THUNDERSTORMS ROAR EVERY MOMENT

AT ANY given moment, there are 1,800 thunderstorms in progress all around the earth.

This number is necessary, Dr. Robert E. Holzer, Professor of Geophysics at the University of California points out, to recharge the earth's electrical field and keep it healthfully "negative."

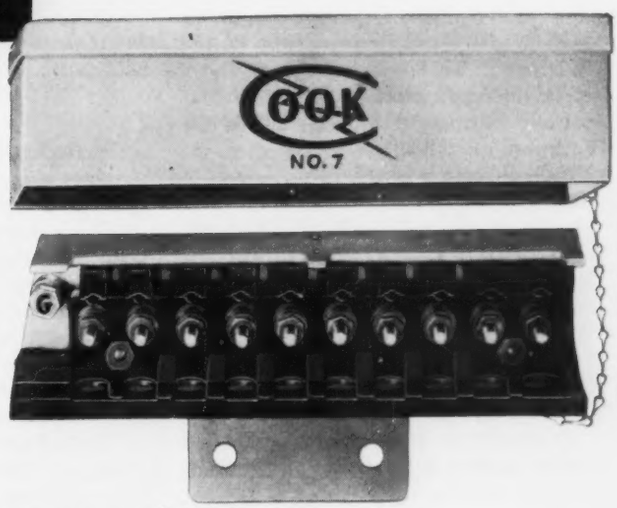
He pictures a tremendous electrical system thus: the sun is the giant generator, thunderstorms are the king-size batteries and the earth and ionosphere are a colossal condenser.

The greatest number of thunderstorms occur when it is afternoon over such land areas as Souh America, or Africa. Measurements by the Carnegie Institution's Department of Terrestrial Magnetism indicate that the earth's charge is at a maximum during this period.

Lightning bolts, seen by the naked eye as a single electrical flash, are repetitive strokes on the average of three times and up to as many as forty times. (Science Service)

THE COOK NO. 7
HIGH POTENTIAL LIGHTNING ARRESTER

The Type 7 High Potential Lightning Arrester provides lightning protection and static drain for 5 pairs of open-wire circuits. This arrester should also be used for the protection of drop wires and cables terminating in unprotected cable terminals where atmospheric conditions require constant static drain. Insulation and fanning strip are single-piece moulded Bakelite. Non-corrosive metal hood, Everdur studs, and galvanized mounting bracket assure satisfactory service and long life. Phosphor bronze fuse clips position the Tru-Gap lightning dischargers which do not normally ground the line.



Extensively used on Rural and Toll Lines Since 1897.

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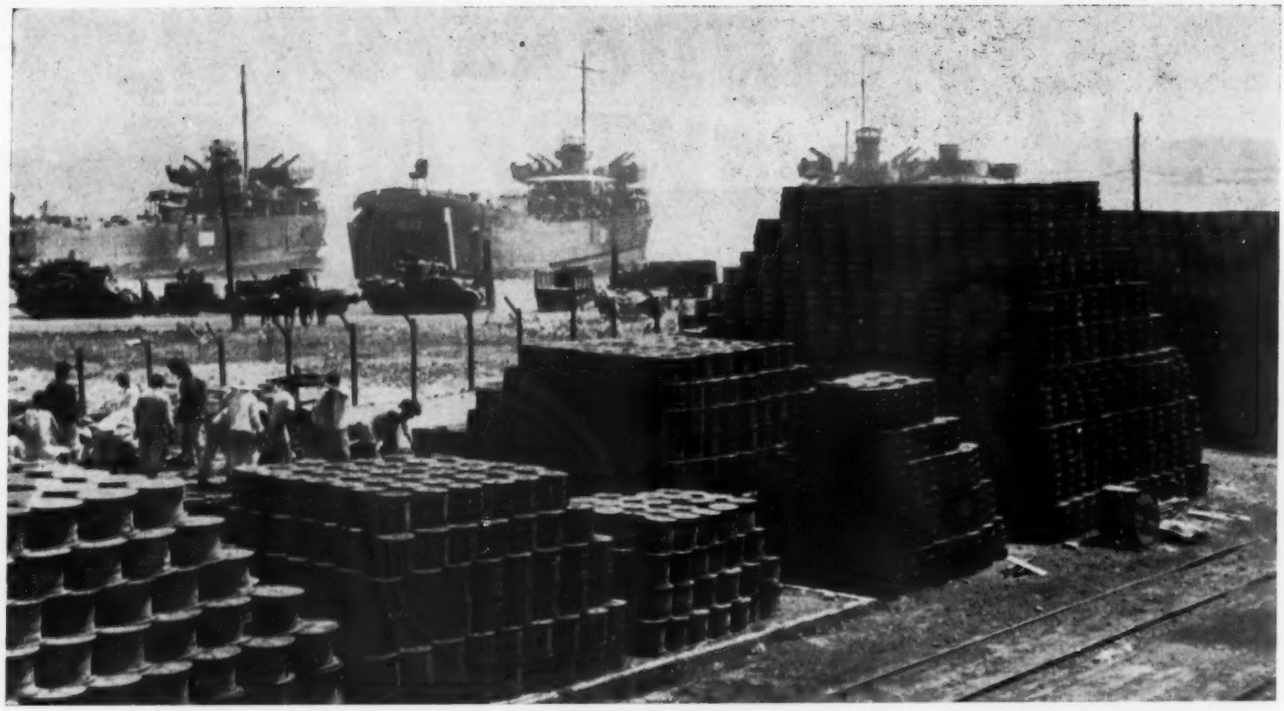


This picture showing reels of wire stacked somewhere in Korea, symbolizes why the telephone industry must save, salvage, and re-use wire and cable. The cold fact is that the nation's copper requirements for civilian and defense needs exceed the total supply available and to do its part of conserving the nation's copper supply, the industry must save, salvage, and re-use all cable and wire as efficiently as possible.—(U.S. Army Photograph.)

Some Thoughts About Material Procurement

*By John P. Boylan**

WE CAN VALIDLY define the job of managing a business as essentially that of solving problems which affect the perpetuation of the business. This means that it is a primary responsibility of the manager of any business to look ahead for the purpose of slanting todays' operations in the direction of the future needs of the business. Future needs of all businesses, large and small, new and old, change followed by change for the purpose of moving ahead. It follows then, that the managers of all businesses, large or small, new and old, prosperous and insecure, have in common the need for accepting an endless stream of problems, as a part of their day to day job. For the most part it is this endless challenge which makes their jobs attractive, and they usually meet it with a confidence born of successful past experience. They look back and recall that most problems can be solved, provided they are recognized sufficiently soon and provided they are seen in their full perspective.

Unfortunately the problem of material and equipment shortage which today confronts the telephone industry does not lend itself to being viewed in its full perspective. We, in the industry, are faced with the need for bridging a gap, the size of which, cannot be determined. No one either within or without the industry can tell us with any degree of assurance how long a period of scarcity is ahead of us. Our position is just as frustrating as would be that of the head of a large manufacturing plant doing business on an international scale, who suddenly found out that his business was without telephone service and that he could not be advised as to the approximate length of time the business would be without service—that is; whether a month, six months or years. It is well to labor this aspect of our problem, because while the operators of telephone companies know that this handicap, which they are powerless to remove, will have an adverse effect on service, the public does not. The public therefore will not develop the tolerance which it should, unless the operators of the telephone companies explain this troublesome aspect of the problem to their customers and the public—and do it in an effective manner, so that it will be generally understood that so long as the inability to gauge the period of scarcity continues, it will be impossible to develop efficient measures to bridge the gap. The small operator has an advantage over the manager of the larger companies in this matter of informing the public because, he is closer to his customers and to the public. He would be remiss indeed if he failed to avail himself of this advantage.

*Mr. Boylan is chairman of The Board, Rochester (N. Y.) Tel. Corp.

Combatting The Shortage Problem

WITH RESPECT to some of the measures which can be taken to combat the shortages which exist today—as well as those which are developing—the first thought that occurs to me is, make the best use of the materials and equipment which you now have, in so far as is practicable. Just as the foundation of a manpower recruitment program

should consist of emphasis on a program designed to keep one's present employees, so the foundation of a material procurement program should be conservation of supplies. I have in mind going beyond constant attention to the "run of the mill" conservation measures; such as good storage, tool care, accurate measurement, and re-use of used materials to the fullest possible degree, to mention but a few of the measures which should be insisted upon in times of plenty as well as in times of scarcity.

It seems to me that, in addition to these—what may be called "routine measures", managers of telephone companies, both large and small, could consider setting up what would be in effect two storerooms. The second storeroom could be used for holding a critical supply of all items of material and equipment which are in extreme short supply or are rapidly approaching that point. Because of the supply situation, items held in this so-called "second storeroom" would not be used unless such use was unavoidable—unavoidable in the sense that a substitute could not be used, and unavoidable in the sense that operations for which the material is being considered cannot be deferred. It seems that such a storeroom arrangement would automatically slow up the usage of material and equipment, the supply of which cannot be readily replenished. As new supplies are received, they could be considered in terms of their critical nature and a decision made as to what amount, if any, should be placed in the second storeroom.

After we have satisfied ourselves that an adequate conservation program is in effect, we can give our full attention to measures for procuring scarce items.

Suppliers' Representatives Are Willing Helpers

I AM TOLD by well regarded purchasing agents, that the most effective source of supply is the salesmen and supplier representatives who, because of your past courteous treatment of them, are anxious to serve you to the best of their ability. Supplier representatives are human and, as a result, can be expected to be more solicitous for the welfare of operators, who, over the years, have established a reputation for courteous treatment than for the welfare of operators, who over the years, have given generously of their time only when they wished to make a specific purchase. This means, that the operators who have not developed a proper relationship with supplier representatives over the years, are not in a favorable position to use todays' best source of supply for scarce items. It also means, and what is perhaps more important, that for those who have been short-sighted in this matter, the time to begin to develop such a relationship is now, so that future periods of scarcity will find them in a position to capitalize upon that relationship. It should be noted well that what I have in mind is not developing a special intimacy with certain representatives or making frequent purchases, rather it is a policy of always seeing and talking to all of the salesmen and the suppliers' representatives who call on us.

John P. Boylan, Board Chairman, Rochester (N. Y.) Tel. Corp.

High upon the list of fruitful sources of supply during periods of scarcity is another program which cannot be developed over night. It is a policy of buying from stable suppliers—suppliers who will be in business over the years and consequently available when we need them. Like the practice outlined in the previous paragraph, the operators who have not in the past adhered closely to a program of purchasing from permanent suppliers, if I may call them that, cannot today take advantage of such a program. Despite this consideration, it is timely to point out that the reasoning used in the preceding paragraph is true in this connection also—that is; that it would be wise for those who haven't such a program, to begin at once to establish a general policy of avoiding purchasing from "fly by night" suppliers, so as to adequately provide for the future. While on this point I should also like to bring out that too frequently, purchases made from "fly by night" suppliers, because of attractive prices, many times prove costlier in the long run than similar items offered by well established suppliers, which are priced somewhat higher. I have in mind that the former many times involves excessive maintenance and short service life which more than offset the initial price saving.

Catalogs Provide Accurate Lists of Supply Sources

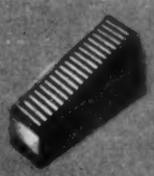
ANOTHER measure which should be fully explored during periods of scarcity is the matter of checking every conceivable source of supply. Large organizations that have purchasing offices are set-up to do this routinely. It occurs to me, however, that some of the small operators may not be using some of the tools which purchasing agents find indispensable and which are available to the small operator. I refer to trade magazines such as "TELEPHONE ENGINEER AND MANAGEMENT" and their comprehensive COMPOSITE CATALOG & BUYERS DIRECTORY and other similar catalogs.

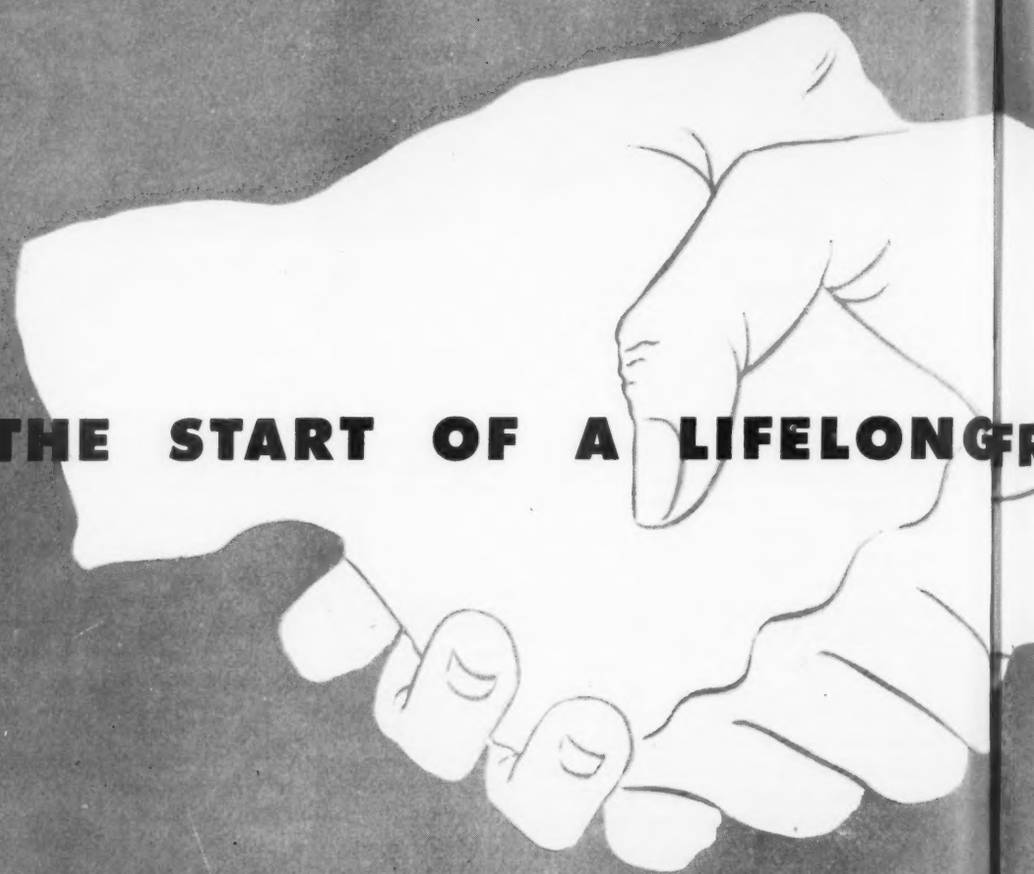
With respect to such catalogues, it seems to me, that any operator who wishes information relative to publishers and price could secure such information from either the state association, the United States Independent Telephone Association or any of the large independent telephone companies. Heretofore some operators of small telephone companies may not have used such sources of information because of mistaken notions about expense. I should like to emphasize, therefore, that all operators could prove-in such media, on the score that the cost of a special effort to secure an item not immediately available could easily exceed the annual cost of the periodicals and the catalogs to which I refer.

Another method which we are told is a "must" with purchasing agents during periods of scarcity consists of "Mohammed going to the mountains". The purchasing agent and his staff find they must forsake their offices and go out and cover all possible sources of supply, including retail outlets not normally used. I suggest that small operators could utilize this principle, particularly with respect to covering retail outlets in neighboring communities.

Closely akin to the foregoing thought is the practice of calling on big suppliers from time to time and making it a point to browse around the factories and warehouses so as to secure some first-hand knowledge about methods and raw materials.

(*Please turn to page* 79)





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	100	S-109 G	Hi-Co Porc. Sleeves		
	8 rolls		3/4" Dutch Brand Friction Tape		
	5000 ft.	P-19-NS	19 B&S Brown Parallel Magnetic Rayon Wire		
	100	6-C&S	Columbia No 6 Dry Cells		
	2	201-T	Klein's Side Cutting Pliers		
	25	S-951	Jeelyte 3 watt Ivy Lamps		
	3	601-A	Leich Common Battery Telephones - the ones you can use on wall or desk Telephones		

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LEICH MANUFACTURERS OF TELEPHONES, SWITCHBOARDS AND RELATED APPARATUS SINCE 1907

At the left, apple trees and the chicken yard of a small farm. At the right, dead brush under the lines, killed by a chemical spray. Choice of a spray material which would not drift into the apple trees or present toxic hazards for livestock was a requisite, in order to maintain good public relations along the right-of-way.

Brush Control and The Public

Informed neighbors along the right-of-way will be as interested in watching the effects of chemicals as you are in keeping the lines clear.

*By Dr. A. E. Carlson**

"NO BREEDING program will increase the value of farm livestock quite so much as crossing them with electricity!"

This is the studied opinion of a superintendent of transmission lines for one of the large power companies in the Northeast. To prove his point, he cites some of the amounts his company has paid in settling claims arising from the accidental killing of livestock.

When he recited these experiences to me, we weren't planning to run a current through purebred cattle—merely to run a spraying crew through some 50 miles of power line right-of-way. It was wooded, rolling country, where the line laced its way between farm fields and across brush-spotted meadows, and the line superintendent wanted to know how many public liability hazards his company might incur in killing the growth under the wires with a chemical!

Almost invariably, when a public utility considers changing from hand cutting to chemicals, for right-of-way clearance, the public relations aspect of the new practice is of equal importance with the effectiveness of the chemical being used and the savings to be realized in time and money.

As an example, seven requirements are set forth by a large telephone company operating in the Southwest as characteristics which should be demonstrated by an acceptable brush-killing chemical. It should:

"1.—Kill the root systems of brush, as well as the above-ground portions in order that lasting benefits may be derived.

"2.—Be low enough in cost to compete with hand cutting.

"3.—Be non-poisonous to humans, animals and wild life.

"4.—Present no fire hazard.

"5.—Not kill grasses permanently.

"6.—Not sterilize the soil.

"7.—Not present an undue hazard to crops."

**Dr. Carlson is Brush Control Specialist, E. I. du Pont de Nemours & Co., Inc.*

Note that at least 50 per cent of the emphasis in these requirements is on the side of public relations, rather than on the matter of efficiency and economy of the chemical.

Fortunately, the three principal chemicals used these days for brush control—ammonium sulfamate, 2,4-D and 2,4,5-T—are not poisonous to warm-blooded animals when used as directed, do not create a fire hazard, do not kill grasses permanently, do not sterilize the soil. When crops are near sprayed areas, a good deal of caution must be used with the highly volatile forms of 2,4-D and 2,4,5-T. In such instances, it is much safer to use ammonium sulfamate, better known as "Ammate" weed killer, which does not tend to drift away from the sprayed area, and which has a reputation as the most versatile and least selective of all chemicals to control mixed species of brush.

Killing brush with a spray gun instead of an axe or brush hook is still a relatively new practice. The general public knows very little about the effects of these sprays. Folks along whose property the rights-of-way pass will naturally be apprehensive of these chemicals. When the brown strip of foliage appears under the lines a few days later, they will have a lot of questions to ask.

One organization which has handled a good deal of right-of-way work under contract is the Davey Tree Expert Co. of Kent, Ohio. In farm communities and populated areas, this company sends a man ahead of the spraying crew, contacting property owners and obtaining permission for the spray operation to be conducted.

"We supply our men who obtain permits with a small pad of printed sheets of information containing six concise paragraphs of what we are doing, what chemical is being used, and how brush elimination will help the property owners receive good electric and telephone service," explains Homer Jacobs, technical services director of the company. "We believe leaving a trail of these sheets with the property owners along the lines where we spray has been a help in maintaining good public relations."

Farmers, who have their own brush problems along fencelines and fields, are often most interested in the spraying operation. Once they are convinced that the chemicals are not poisonous to livestock, they will ask many questions, which should be answered as accurately as possible.

The fear that these chemicals will kill all grass and make the ground bare and sterile often brings complaints and protests from garden clubs, civic improvement associations, conservation officials, or others interested in the preservation of wild life.

Often a few pictures of the sprayed areas, taken a year or two after spraying, will alleviate these fears. Where grass and low-growing plants are shown to come in abundantly once the brush with which they have competed is eliminated, the improved appearance of the countryside and the better feed supply for birds and other small game is readily recognized.

There are other benefits, too, that can be pointed out. Poison ivy, poison oak, and poison sumac are killed by the sprays, particularly if "Ammate" weed killer is used. In the northern reaches of the country, brush along fences and roadsides, where wires often run, acts as a snow fence, causing drifts on roads and in yards. The removal of this brush is most welcome.

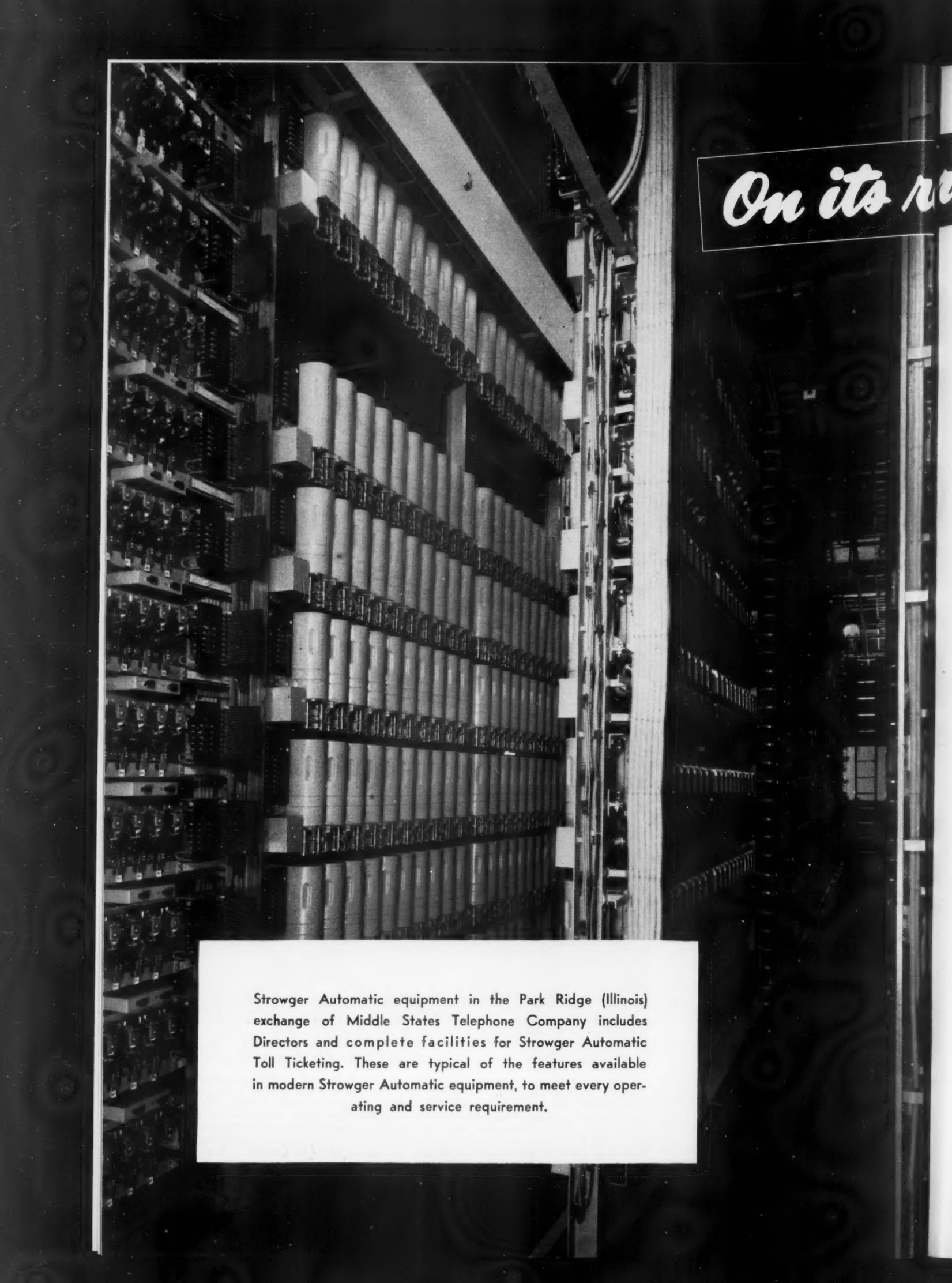
Where the brush clearance job is a roadside one, there is another good feature to point out to the wild life conservationist. Along any busy highway, the remains of rabbits and small game crushed under wheels of passing vehicles are mute evidence that this is no place for game refuge. Reducing the brush cover to grasslands which provide shelter only for small birds will greatly cut down this roadside game mortality.

It's only natural that we're all a little resentful of having a crew of men invade a section of our property, no matter how laudable the purpose. But even from this standpoint, there's a good public relations approach to chemical control as more desirable than hand cutting.

With a good job of spraying, you can assure the property owner that it won't be necessary to send crews back nearly so often as in the old days when every severed stem sent up twelve new sprouts and regrowth was thick and rapid.

Once informed of just "what goes on here," you'll usually find your neighbors along the right-of-way as interested in watching the effects of the chemicals as you are in keeping the lines clear. A little information, given in a friendly way, will pay big dividends in public approval.

Here's a place where careful spraying was necessary to keep the neighbors friendly. Outside the fence was brush and a tree that threatened to grow into the lines. Inside the fence were valuable ornamental cedars and climbing the fence were flowering vines. The defoliation of the tree and dead, curled leaves of the brush shown here proves how well the spraying crew performed its task. Growth inside the fence was unharmed. To avoid damage to estates along which this New York line skirted, ammonium sulfamate was used at three-quarters of a pound per gallon of water. By careful direction of the spray, this non-volatile chemical killed brush without endangering nearby plants.



Strowger Automatic equipment in the Park Ridge (Illinois) exchange of Middle States Telephone Company includes Directors and complete facilities for Strowger Automatic Toll Ticketing. These are typical of the features available in modern Strowger Automatic equipment, to meet every operating and service requirement.

CHOOSE STROWGER AUTOMATIC

FOR *today and the future!*

Strowger Automatic is the only type of automatic switching equipment which meets all conditions of operation in the Independent field, and has been doing so for over fifty years!

That record of success, in hundreds of exchanges—large and small, single-office and multi-office—is your assurance that Strowger Automatic, made by Automatic Electric, will meet all your needs—today and in the years to come.

Long experience has proved the sturdiness of this equipment, its long life, its adaptability to changing conditions, its low cost of operation and maintenance, and its service to users. These qualities are matters of record—not guesswork.

Telephone men today are facing many problems; but choosing automatic equipment is no problem at all. Look at the record, and your choice will be Strowger Automatic.

AUTOMATIC ELECTRIC

Originators and Developers of the Strowger Step-by-Step "Director" for Register-Sender-Translator Operation . . . Machine Switching Automatic Dial Systems
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Fig. 1—Problem facing Associated Telephone Co. telephone engineers was to permit the extension of the Sawtelle-Westwood flood control channel under Venice boulevard in Mar Vista without expensive re-routing of underground telephone cables running along Venice boulevard. The board in the foreground represents one step in the solution offered by two fieldmen. Wrapped around the board is a rope tied to the cables unearthed at the bottom of the ditrh.—(Thanks to the ASSOCIATED CIRCLE for the illustrations accompanying this article.)

"How To Do It" Suggestions

"Aerial underground" cable solves $12,000 re-routing problem . . . Brush chipper machine aids plant men . . . Vertical measuring rod takes guesswork out of clearance measurements.

By John G. Reynolds

Managing Editor,
Telephone Engineer Publications

THE TERM may be confusing to most telephone men, but Associated Telephone Co., Ltd., Santa Monica, Calif., has developed an *aerial underground cable conduit.*

The innovation (See Figures 1-5) was designed by Western district fieldmen R. B. Morgan and Lloyd Martinsen to solve a $12,000 problem that involved rerouting a 900-pair cable, a 200-pair cable and a 100-pair cable to permit U. S. Army Engineers and the Los Angeles Flood Control Commission to extend the Sawtelle-Westwood flood control channel under Venice boulevard at McLaughlin avenue in Mar Vista.

Similar problems have been met in the past by re-splicing the cables at the manhole nearest the construction project, setting special poles, and running catenary lines aerially over the project to connect at the nearest manhole on the other side of the project.

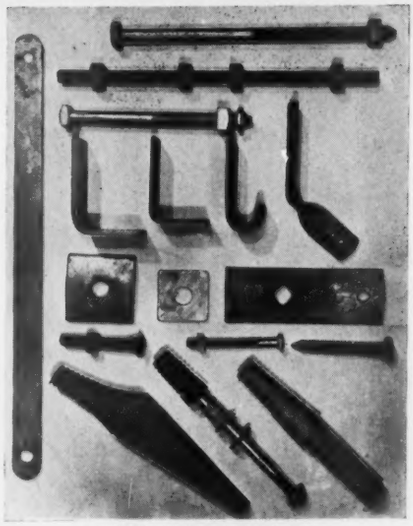
That would have cost about $12,000 in this case.

Morgan and Martinsen determined that if the existing cables were temporarily raised five feet there would be 18 inches of clearance for the 14-foot high reinforced concrete flood control channel that is open from its source near Sunset boulevard to that point, and roofed over as a bed for McLaughlin avenue from that point south.

Morgan and Martinsen carefully figured stresses and possible expansion in the various cables in use there and determined that there was enough stretch in the 160 feet of cables to temporarily turn the underground cables into aerials.

Two days before work started on the raising of the cable, the flood control channel which had been ended at Venice boulevard three years before because of lack of funds, erupted with a flash flood and covered Venice boulevard, including the area where the ditch was to be dug.

Convinced by the incident of the importance of the extension of the flood control channel, but also worried whether such a recurrence would happen while the cables were exposed, Morgan and Martinsen found other factors to worry about. Bending the cables at the ends of the



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No.	Description	Rod Size	Price Each
C-64	6"—4 Way	½—¾	$2.15
C-6870	6"—8 Way	½—⅝	1.70
C-88135	8"—8 Way	¾	2.78

ANCHOR RODS

No.	Size	Wt. Lb.	Price Per 100
5305	½" x 5"	350	$ 90.27
5306	½" x 6'	450	99.33
5316	⅝" x 6'	650	135.26

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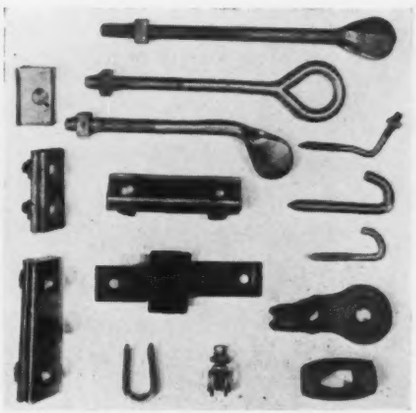
7020	20" Brace	$22.06
7024	24" Brace	26.04
7026	26" Brace	28.01
7028	28" Brace	29.99
7030	30" Brace	31.97



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1½" x 2" x 10" Oak Brackets, per 100 .....$5.00
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Complete with 6 foot non-kink, Cable and Hooks....$15.95
Same with 9 ft. cable 16.95

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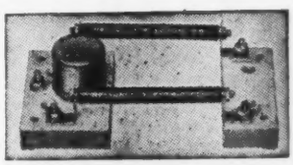
42"	4 pin 2¾" x 3¾" Pony Crossarms, per 100	$139.20
62"	6 pin 2¾" x 3¾" Pony Crossarms, per 100	208.80
82"	6 pin 2¾" x 3¾" Pony Crossarms, per 100	243.60
102"	10 pin 2¾" x 3¾" Pony Crossarms, per 100	313.20



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Protectors, Station, W. E. 58A, with new fuses, each $1.15

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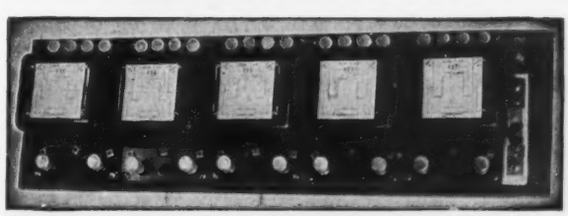

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TEN KEYS TO FASTER LONG DISTANCE SERVICE

Planning and building for the future are basic to the telephone business. Some improvements, like Operator Toll Dialing, may take years from drawing board to daily service.

Today Operator Toll Dialing is ready when the Nation needs it most. It's putting extra speed behind important Long Distance calls—and proving the value of the development work begun so long ago.

The story of Operator Toll Dialing is told on the opposite page, as it will appear in national magazines during the month of April.

An advertisement of the

BELL TELEPHONE SYSTEM

New way of handling Long Distance

Operator Toll Dialing proves a big help in these busy days of national preparedness

Long Distance lines are really humming these days. There are many more calls than a year ago. More are from the Nation's industries and Armed Forces, hurrying the country's most important job.

A big help in keeping these calls moving is Operator Toll Dialing—a remarkable new telephone development.

You give the Long Distance operator the number in the usual way. She quickly presses several keys and your call goes straight through to the telephone you want in a distant city.

It makes for faster service — especially on calls that formerly had to be relayed through other cities.

With so many more calls on the lines, it's a mighty good thing that Operator Toll Dialing was developed and is now available and in use in so many places. About one-third of Long Distance calls are now being handled in this new way.

It is just one of many ways in which the growth and improvement of telephone service are now proving of extra value to the Nation in these days of preparedness.

ANOTHER STEP FORWARD...

More and more telephone users in a growing number of metropolitan areas can now dial Toll calls direct to nearby places the same way they dial Local calls.

BELL TELEPHONE SYSTEM

Fig. 2—Construction of the covered section of the flood control channel south of the cable was extended under one-half of Venice boulevard by the time the excavation of the telephone cable was begun.

Fig. 3—With A-frame up and a large part of the cable exposed, R. B. Morgan, one of the originators of the plan, stands in the ditch in the center picture discussing it with Bernard Le Baron, Western district engineer. In the background, other utility men ponder the removal of a water main to make way for the flood control channel.

Fig. 4—At right, Bud Morgan ch the plank protection of the co visible under his left knee while aw ing removal of the water main obstructed the raising of the cabl

50-foot span where they left the underground conduit to begin the aerial curve was a ticklish job. Great care was taken to avoid damaging the lead sheaths which might permit water to enter. There was some worry whether the predicted slack would materialize without dislodging other equipment. There was also some worry whether the A-frames and suspension cables would hold the half-ton of cables and conduits over the 39-foot ditch while the flood control conduit was being constructed underneath.

With great care, all three possible disasters were avoided and afterward the cables were lowered into place on top of the concrete flood control conduit beneath the surface of Venice boulevard.

And the new method worked out by the district fieldmen saved $8,000 of the previously estimated cost of $12,000.

Fig. 5—Completed aerial-underground cable with a bulldozer hard at work underneath, clearing a channel for the pouring of the final section of the concrete flood control channel.

Pacific Bell Calls It A "Chew-Chew" Machine

ZING-ROWR-ZING! goes the whining ballad of a new brush disposer used in the Washington-Idaho area of Pacific Tel. & Tel. Co.

Known as a brush chipper this machine is used by construction and maintenance forces in the continuous work of clearing brush and trees from beneath telephone wires. After cutting, the trees, up to six inches in diameter, and brush are thrown into the hungry mouth of the chipper and reduced, almost instantly, to chips and shavings blown out over the right of way. According to *Pacific Telephone Magazine*, hauling and burning are practically eliminated and brush disposal operations are speeded up. The chewer, with two men feeding it, can dispose of all the brush that 12 men can cut. Tree

HIGHWAY—the first name in field construction and maintenance

Highway is America's major supplier of telephone line construction and maintenance equipment. It offers you the abilities of engineers and craftsmen long trained in this specialty.

Highway equipment has a reputation for being just a little better on every count. What's responsible for this is, we believe, something beyond the finest in skills and production facilities. It is an attitude—the unrelaxing determination to produce only the very best.

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2. Model IU-76 Installer's Unit. Scientifically arranged equipment compartments and tool carriers for most efficient work. For mounting on ½ ton trucks.

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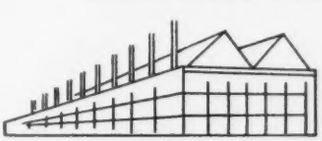

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Fig. 6—Lineman Robert Gill (foreground) and Driver Charles Welliever of the Pacific Tel. & Tel. Co. shove brush into the whirring blades of the chewer. A flying shower of chips and shavings results.

trunks too large for the machine are given to local residents or disposed of in other ways.

Powered by a 45-horsepower gasoline engine, the cutter's 9-inch blades revolve at a speed of 2200 revolutions per minute. Under steady usage a set of blades will last six to ten days between grindings depending upon the hardness of the woods being "chewed." The outfit is mounted on a two-wheeled trailer. (See *Fig.* 6.)

One of the greatest advantages to the use of the brush chipper is the

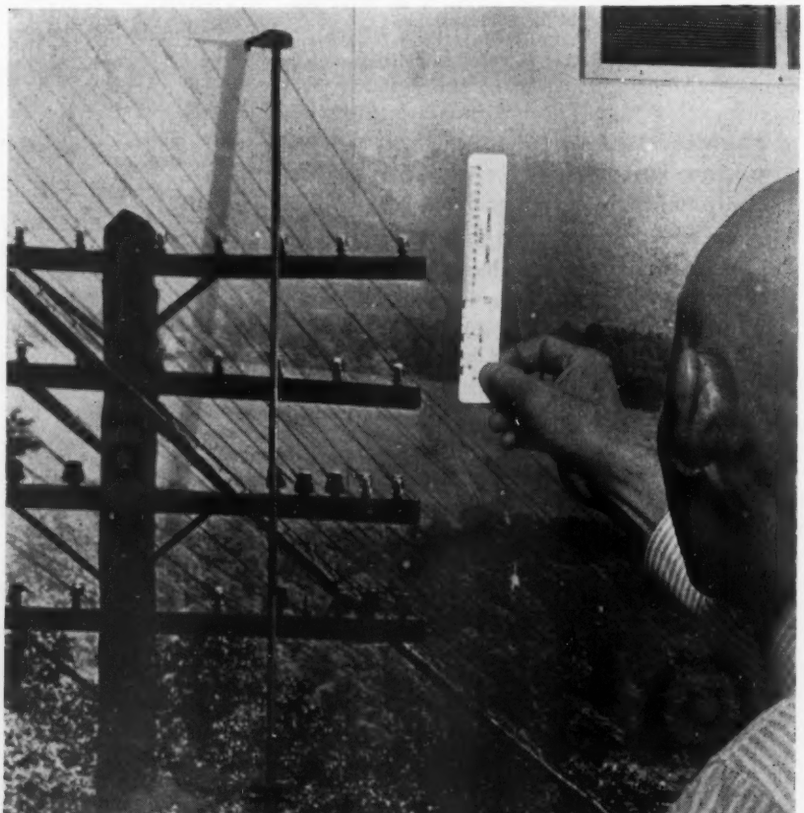


Fig. 7—Resting the top four-foot section of the "Vertical Measurng Rod" against a photograph of telephone lines, Frank Stetler illustrates how to sight with a special scale to measure accurately the clearance between telephone and power lines, the latter not being shown in this picture.

elimination of the forest fire hazard created by brush piles which can't be burned in the dry season. Once the right of way is cleared it is planned to use chemicals to control future brush growth.

'Phone, Power Line Clearances Measured Quickly, Accurately

"HOW CAN WE measure the clearance or distance between telephone wires and a power line crossing over them?" That's a question that has given telephone engineers and plant men a lot of headaches for many years.

Sometimes they stood off a distance and randomed a guess. Swaying wires, angling lines, and no marking point made this a difficult and inaccurate method. When practical, some might estimate the height of the telephone and power poles. But this way also could lead to error when there were long spans. To throw a measuring tape or rope over the power line where it crossed over the telephone wires was dangerous due to the high voltages being carried by the power lines.

At best, the measurement of clearance often was a matter of rough estimate when the man in the field wanted to check to see if clearances conformed with requirements. Improper clearances create unsafe conditions, endangering telephone workers on the job.

This shortcoming irritated Frank Stetler, Milwaukee Division plant engineer for the Wisconsin Telephone Co., who has had to check a lot of clearances. So he set out to find an easy, accurate means of having one man quickly determine clearance measurements in the field. That was in October, 1948.

Today, Stetler's "Vertical Measuring Rod" has Bell System approval, has undergone Bell Laboratories studies, and is in production through Western Electric. And there is a brisk interest in the measuring rod among associated companies. Twenty "pilot" models were produced at Milwaukee in June, 1949, and have seen wide use in the State and Milwaukee Divisions since that time.

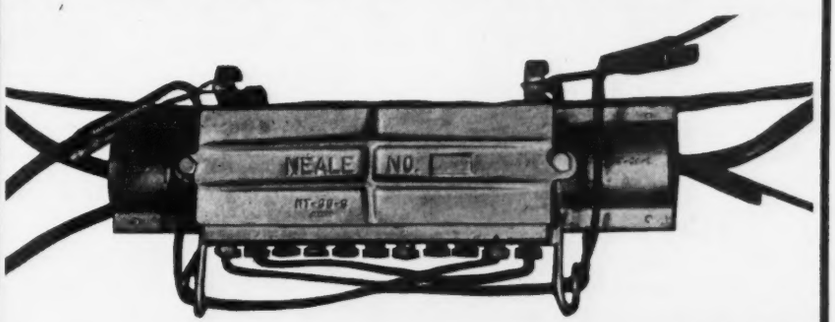
Basically, Stetler's device utilizes the simple process of matching a known distance—a four-foot section of the rod—against an unknown distance—the clearance between the power and telephone lines. The two instruments used in the field, the vertical measuring rod and the wire clearance scale, can be carried in a convenient canvas roll.

Actually, the measuring rod consists of seven four-foot sections. The top four-foot section is the important one. The other six are needed to extend up to the telephone wire where a red hook on the top section is hung over the wire at the exact point where a power wire crosses above. Exactly four feet below the hook is a red plastic disk.

The man in the field now takes the small measuring scale and walks about 40 to 90 feet away from the rod hanging on the telephone wire. At the midpoint on the scale is a "0". Above the "0" the scale is divided into 16 parts and numbered from "1" to "16". Below the "0" is a marking with a 4" along side.

Resting the scale vertically against a solid surface—a pole, car, or tree, he moves his eye closer or away from the scale until the top hook disk on the rod is lined up with the "0" and the other marking disk four feet down the rod is lined up with the "4" on the lower portion of the scale. Then, looking above the "0", he sights where the power line intersects the upper half of the scale. If it's at the "6" calibration, the clearance is six feet; if it's at the "12.5" mark, the clearance is 12 and one-half feet. If the measuring rod hooked over the telephone wire causes the wire to sag, for this in the calculations.—THE END.

Save 5 to 15 Man-Hours per Cut-in with the *NEW NT30 NEALE TERMINAL!*



■ Yes . . . now you can cut down costly man-hours on cut-ins! Now you can save money on terminal replacement costs! The new NEALE NT30 TERMINAL makes it possible for one man—WORKING ON THE POLE ONLY 15 to 45 MINUTES—to make a complete cut-in! No wire cutting or splicing necessary. No joints to wipe . . . no seams to float.

■ Move the NEALE NT30 to another location whenever desired. Forget about retailing or junking used terminals, because with the NEALE, you can use it over and over again.

■ Heavy pressure vulcanizes the long, heavy rubber sealing plug in the NEALE NT30 to the cable sheather and terminal shell. Terminal is then gas-pressure tight, moisture and insect proof . . . resistant to face plate leakage. Entire unit can be safely wired or gas-pressure tested.

■ For complete information on the new NEALE Terminal, contact your jobber, or write direct to:

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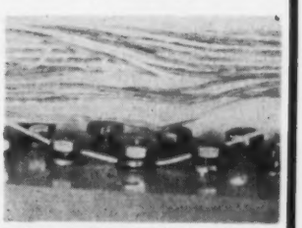
Face Plate


Connection to Cable Pair

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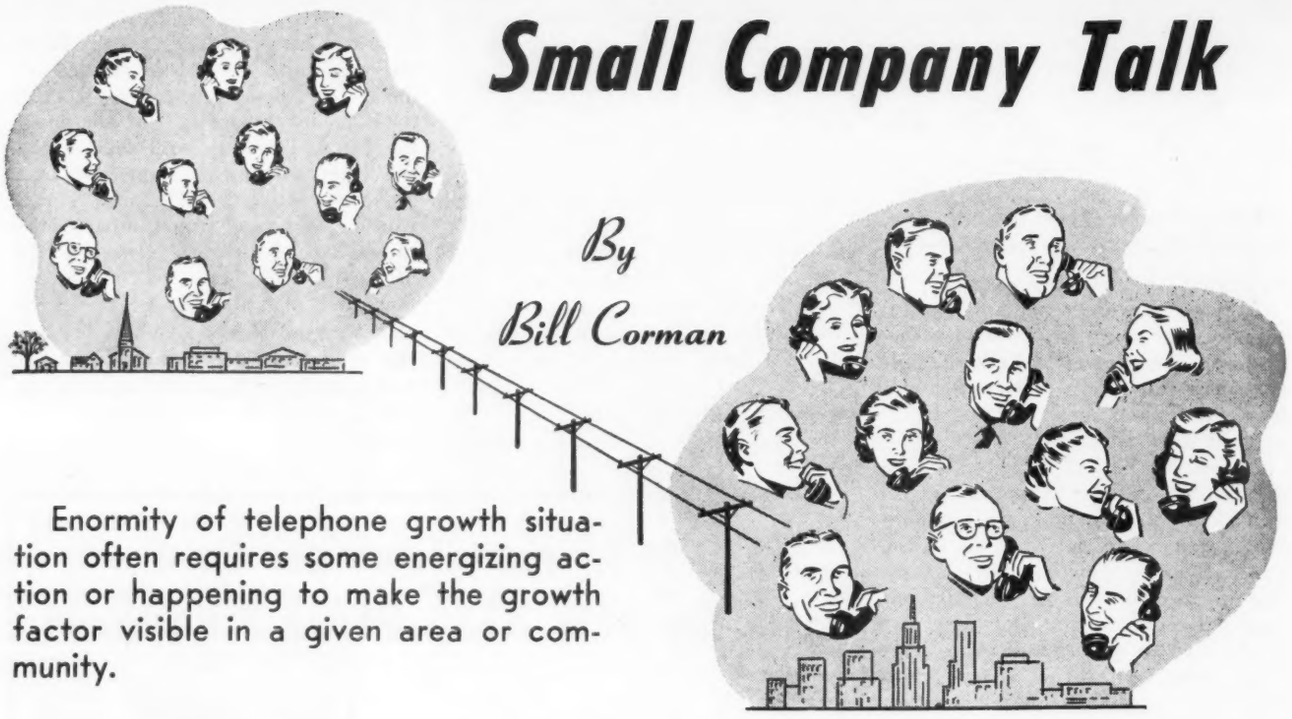
Small Company Talk



By Bill Corman

Enormity of telephone growth situation often requires some energizing action or happening to make the growth factor visible in a given area or community.

HI, NEIGHBOR! Let's talk about telephone growth. From one point of view, this may not seem to be a particularly auspicious time to bring up such a subject, what with all the Washington Alphabet being thrown into our laps again; but from another point of view it *is* important that we think about this subject at this time. The fact that forethought and plans are even harder now than ever, has the result of making them even more important. What we insist on being allowed to do must have cogent reasons and hardheaded thinking behind it.

The telephone industry, since the end of World War II, has been going through a period that can rightly and justly be called nothing less than a Revolution, accompanied by a growth that, to most telephone men, is nothing less than fabulous. We are still in that period, and regardless of war or no, we are going to be in it for the indefinite future. My personal belief is that most men now in the telephone business will not live long enough to see this revolution and growth come to an end.

For example, does anyone look upon operator toll dialing as an *end?* Of course not. If they did, they would not have qualified the name by the word "operator". It is obvious, even before operator toll dialing is widespread enough to be called universal, that people in the industry have begun to think toward subscriber toll dialing.

Another example. With forty-three million telephones in service in the U. S. now, does anyone look upon fifty million as the ultimate, or even sixty million? Of course not. Everybody frankly admits that they can't even guess at what the ultimate saturation figure might be.

Big Problems Apply To The Smallest Units

BUT THESE are big problems, you might object, for the big boys to figure out. Not so. Even the biggest problems come right down to the smallest units—right down to you and me. Let's go back to the operator toll dialing again. Have you wondered just what the ultimate effects of this method of toll operation are going to be? My personal conclusion, and to me it seems inescapable, is that this method of toll operation is going to force every telephone exchange in the United States, sooner or later, to dial operation—or out of business. Now that is a strong statement, but is not to be construed as even a slight criticism of the toll dialing program. It is merely the answer I come up with when I go through the cause and effect chain of reasoning.

Just figure it out. Operator toll dialing has been logically determined to be the only way to reduce completion time on toll calls, and as a corrolary, one of the ways to reduce the *real* cost of toll calls (cost based on *real wages*). And these conclusions are based on the calculated reduction in operator handling time of the average toll call. Now it must be obvious, in order to realize the maximum saving, that the called telephone must be connected to a dial exchange. If it is not dial, one additional operator will usually be brought into the picture. Even now, the big majority of all telephones in the United States are dial, and this percentage grows all the time.

It follows then, that toll call charges will come more and more to be based on the cost of a call of the following description: originating at a dial telephone, connected by operator toll dialing, and terminating on a dial telephone. Toll settlements are based on toll rates. Therefore, toll settlements will be more and more affected by the cost of the above described call. This means that the manual exchange will be placed in a squeeze. For not only will it have to maintain operators to complete its end of the toll call (or pay another exchange to perform this service for it), but it will be squeezed on its toll settlement, and in two ways.

First the toll settlement will be based on a cost that is *less* than the manual exchange's average cost. Second, there will undoubtedly be pressure in some form or another (perhaps *reduced* toll settlement rates to manual exchanges) because the originating operator is put to more trouble to complete a call to a non dial telephone than she is to a dial telephone. In other words, it seems logical that toll settlements granted to a manual exchange would be *less* than those to a dial exchange.

So the manual office will be between double squeeze rollers—its higher cost of terminating toll calls.

(Please turn to page 60)

Because you're cost-conscious, you'll appreciate this timely tip on drop wire. No. 18 Copperweld* Drop Wire actually costs you less than No. 17 drop wire of other types—and yet it has the same breaking strength—340 pounds. This means substantial initial savings for you.

And—because each Copperweld wire combines the rugged strength of alloy steel with the permanence and conductance of copper, you're sure of greater mechanical safety, longer life, excellent voice transmission characteristics and reduced maintenance expense. So—for real economy, from first cost to last, use No. 18 Copperweld Drop Wire. It's available with all types of insulation in twisted pair and parallel constructions.

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and its lower toll settlement rates. Such reasoning is what leads me to believe that the manual exchange will be forced out—and economic necessity will be the forcing element.

Thus, even the biggest problems have direct and far-reaching effect on the small company. But, though they do affect us, we do not have to go so far away from home to originate problems. We have this same type of problem, and should apply the same type of consideration, in our small everyday situations brought on by this revolution and growth that I have mentioned. Buying a position of switchboard or a new board, installing a new run of cable or laying out a whole new cable plant, adding a rural circuit or building a whole new rural lead, installing a telephone or laying plans to catch up with all the held orders—all of our construction problems, big and little, need thoughtful consideration in connection with this revolution and growth.

Growth Factor

IN SPITE of the fact that this growth situation has been with us now for about five years, the enormity of it has been grasped in far too few companies. This is so probably because it takes some energizing action or happening to render the growth factor visible in a given area or community. This happening can be almost anything—a sale of the company, a big new industry coming into the area, a decision to "go dial", a (planned at the beginning) small construction or modernization program, the addition of a toll circuit or two affording better toll facilities—almost anything can be the match that lights the fuse to the explosion. And after the "happening", whatever it may be, it is not usual for the *entire* growth possibilities to be immediately apparent. It is like climbing a rounded mountain—the higher you go, the higher you can see that the top is.

Let's take the rounded mountain comparison a little farther. You are sitting in a valley (your telephone company) but haven't been able to see very far because of fog. Then the "happening" happens. A breeze comes along and lifts the fog. You can see the mountain and gradually realize you must climb it. So you figure it out, carefully, you think. You consider the terrain, the distance, the obstacles, and come up with the answer that it will take you a day and a half to climb and half a day to come back down. If you eat before you start and immediately after you get back, you will need to take along food for four meals. So you pack four meals and start out. At the end of a days climbing, you have eaten two of your meals, but from your new vantage point, you can see that the top is a lot higher than you thought. It appears however, that if you divide each of your two remaining meals in half, thereby making four more skimpy meals, you will have enough to make the top as you now see it and get back again. But at the end of another days climb, you only have two of your half-meals left, and the top has again receded into the higher atmosphere. So you turn around, go back down and begin to make plans all over again.

Exactly this same sort of thing has happened in many telephone companies. And it has happened enough times to establish the basic facts as being almost universally applicable. Now our climber in the example above made two principal mistakes. While he was still in the valley, he should have backed off and taken a longer look at the mountain. You can't see the top of a rounded mountain from its foot, but you *can* see

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the top (or reasonably close to it) if you back off and take a look from a distance. Many times you have to "back off" from a problem and view it in its overall aspects before you can come to a good decision.

The second mistake the climber made was at the end of the first day. By then he should have known that he was up against something much larger than he had originally thought. He had so far wasted only one day, and he should have gone back down then to reconsider and replan. But he trusted to luck that *maybe* the top was where he could then see, and decided to go on. In so doing he wasted a whole additional day climbing and part of still another in descent. Likewise in the telephone business, we commit ourselves to a certain growth-and-construction program. The first point at which it becomes obvious that we have made a mistake is the point at which we should begin to reconsider and replan. Making a mistake is expensive, but not nearly so expensive as *persisting* in a mistake because of stubborness or the vain hope that "maybe it'll turn out all right after all".

Growth Possibilities Should Be Studied

YOUR GROWTH possibilities should be studied as carefully as you know how to study, and your decisions should be based on the widest view of the situation possible and all the factual information you can get. It is not always possible,

(*Please turn to page 76*)

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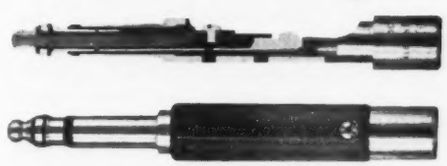

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QUESTIONS and ANSWERS

In this issue Mr. Mitchell discusses—(1) Western Electric Amplifier Number 111 B for persons suffering Impaired Hearing, (2) Western Electric Key Number 6030, (3) Probable Faults in Connections and Operation of Testing Voltmeter Shunt, (4) Advantages and Disadvantages to be Considered in Question of Directly Burying Telephone Cable, and (5) Voltmeter Shunt Resistance Formula.

PROBLEM: SOLUTION:

By Jay G. Mitchell

QUESTION:—What is the principle of operation of the Western Electric 111B mechanical Amplifier? What gains are obtainable from it? Could it be used advantageously in a magneto set? How would it be connected?

ANSWER:—The Western Electric 111B Mechanical amplifier is designed to be used in telephone sets for persons suffering impaired hearing. It consists essentially of a permanent magnet telephone receiver unit and a carbon type transmitter button or unit both of which are attached directly to a common diaphragm. The whole is assembled in an aluminum alloy case with three terminating cords brought out. These cords are colored as follows. Black to transmitter, white to receiver and red common to receiver and transmitter. The impedance of the receiver unit is about 50 ohms at 1,000 c.p.s. and the approximate resistance (D.C.) of the coils is 30 ohms. In a 4½ volt circuit the resistance of the carbon transmitter unit is approximately 150 ohms.

An arrangement of this amplifier mounted in a metal case with the required control key can be secured. It is known as Western Electric Number 6030 Key. The detailed connections depend, of course, upon the type of telephone with which it is proposed to use this equipment. The amplification can be adjusted for two different values.

QUESTION:—I have been reading with great interest your installments on "The Voltmeter In Telephone Line Circuit Maintenance." There is one question I want to ask. Where can I get a 200 ohm shunt like you described (or how can I make one)? I have tried several things with approximately 200 ohm resistance such as retard coils out of a radio, transformer and switchboard drops. For instance, I took a switchboard drop

Jay G. Mitchell, Consulting Electrical Engineer.

which has 500 ohm resistance. I unwound the coil to 200 ohm resistance. Practically all shunts I used showed 35 volts with a direct short instead of 50 volts. I have a 50 volt, Weston Meter, Model 301-200. Enclosed is a stamped and directed envelope for your reply.

ANSWER:—It is assumed that the voltmeter used by this correspondent is undamaged. Therefore the reading obtained with all the makeshift shunts (35 volts) is the drop around the shunts the difference between the readings for the several trials having passed unnoted. In that case it is probable that the battery used is of insufficient capacity and when the circuit is closed through approximately 200 ohms the resulting drain on the battery causes the voltage to fall from the norm of 50 volts to approximately 35 volts. A storage battery such as the office battery of the common battery exchange system, which will be unaffected as to the voltage by the drain through the voltmeter shunt, is very much preferable. In any event whatever type of battery is used it must have ample output capacity so that the E.M.F. does not drop appreciably under the drain of the testing equipment.

Another explanation may be that the leads from the battery contain resistance that should be eliminated in order that the voltage for the test during the test is, as specified, *exactly 50 volts.* The shunt must be *non-inductive* and of a wattage dissipation rating, as specified, of at least 15 watts. An Ohmite Resistor which can be obtained in any radio supply store, of these specifications, will be excellent.

Check your testing arrangements especially the connections to the battery and write in again if you do not find the trouble.

QUESTION:—Have been reading your QUESTIONS AND ANSWERS *department and enjoy it very much as it helps to do things in the best and right way. Would like to know about putting new cable (telephone) in the ground with that covering of tar or compound and what are the results for the life of the cable.*

Can old cable be lowered (aerial) that is in fair condition and have it serve with fair results for a time. Our pole lines are not too good for hanging cable so if the new method of underground is O.K. perhaps we will try that. Thank you very much.

ANSWER:—The advisability of installing telephone cable direct in the ground is necessarily decided upon consideration of several factors. The first matter to be decided is whether the proposed installation is to be deemed permanent or temporary. If it is temporary then many of the considerations which must oppose the use of buried cable will not have as much weight as they would have if the proposed installation were permanent.

Since cable that is buried is more or less in contact with the earth throughout the extent of the buried

segments it must be assumed to be subject to damage due to corrosive elements in the soil, to moisture and to electrolysis. For this reason alone it is necessary that cable to be buried should be free from sheath cracks, pinholes and thinly worn areas and these considerations almost rule out the installation of old or reclaimed cable. In my opinion only cable that is provided with a *perfect sheath* should be buried regardless of the type of protection given it.

After it has been decided to install a run of buried cable complete records must be made because one of the disadvantages of this kind of construction is based upon the difficulty of locating the cable in case of trouble. In the case of cable that is installed in conduit, on the other hand, the records are complete, there are manholes and handholes through which access may be had to the cable and repairs are facilitated. Therefore the telephone company installing cable in a trench must make a very accurate and complete set of records in order to be able to quickly and effectively locate the cable in case of trouble and also in order to make it possible to supply the buried cable records to the city authorities so that digging operations by water and sewer departments and others likely to damage the cable may be avoided in many cases because such location records are available.

The protection for buried cable may be of several types. Some provide mechanical protection against damage due to digging operations and some provide only a very simple and not too permanent type of protection aginst corrosion, moisture and electrolysis. In general these types of protection are the following:

(1) Heavy coat of asphaltum varnish applied hot directly to the cleaned sheath of the cable. As long as the film of asphaltum is continuous corrosion, moisture and electrolysis are minimized.

(2) Heavy coat of asphaltum varnish applied hot to the cleaned sheath of the cable which is immediately wrapped with a continuous layer of building paper over the hot asphaltum. This is somewhat superior to the plain asphaltum.

(3) Creosoted plank laid along the top of the cable in the trench after either number 1 or number 2 protection has been applied.

(4) Split tile conduit placed over and under the cable after the application of either number one or number two protection has been applied. It is claimed that the use of the split tile protection eliminates the ne-

(*Please turn to page* 77)

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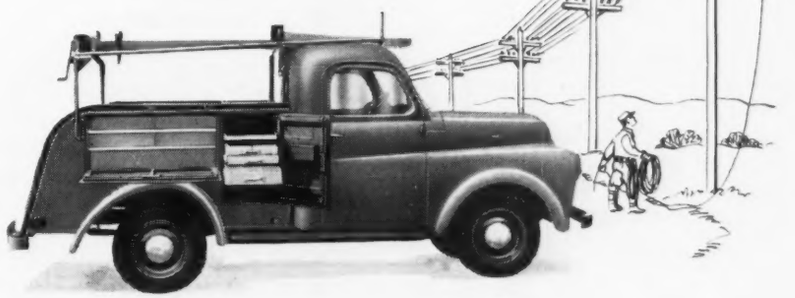

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York-Hoover Corporation

YORK, PENNSYLVANIA

Body Division

Drop Wire & Cable Maintenance

(Continued from page 35)

followed by two layers of friction tape around each wire in a run may be substituted for the loom, if preferred, to provide the desired protection.

Drop Wire Supports —Sag Requirements

A SERIOUS source of drop wire trouble is the old time drop wire tie used in fastening drop wires to pole and building attaching fixtures. No matter how well made the tie is, the drop wire is soon damaged by the swinging stress at the support and by moisture retained in the tie after rains. On the other hand, drop wire clamps take up the swinging stress and transfers it to the clamp loop on the fixture. Moisture entering the clamp soon dries out. Moreover, the new type of drop wire with synthetic rubber or plastic jacket is simply not adaptable to tying to supporting fixtures. Old type clamps (with short wedge) have caused some trouble when used on small diameter drop wire, but drop wire clamps with longer wedge and more bearing surface are available to eliminate this fault.

It is the writer's opinion that the installation method is often the cause of trouble with drop wire not holding in the clamps. Such trouble can be prevented by taking the simple precaution of tightly setting up drop wire clamps when installing the drop. Furthermore, a slack loop should be provided between two drop wire clamps on the same wire at the same support, or between the clamp and the secondary fixture attaching the building run at the span attachment, as indicated in *Figure* 11.

Drop wire spans should be strung to the proper sag for the length of the span is indicated below; to reduce the strain on the wire and drop clamps at the supporting fixtures:

Length of Drop Wire Span	Sags— Pole to Building		Sags— Pole to Pole	
	Heavy Loading	Light or Medium Loading	Heavy Loading	Light or Medium Loading
0 to 50 feet	6″	6″		
51 to 75 feet	12″	12″		
76 to 100 feet	24″	24″	18″	18″
101 to 125 feet	48″	36″	36″	30″
126 to 150 feet	72″	48″	48″	42″

Sags greater than 150 feet are not recommended, as it is difficult to obtain adequate clearances from the ground with the greatly increased sags that would be required, and, in addition, spans over this length will place considerable strain on the drop wire clamps and may result in the clamp loops wearing through in windy locations, particularly when the clamps are attached to drive hooks.

It is possible to avoid excessively long spans in cable leads by using span clamps to pick up the drop span along the cable span. In other cases, drop poles may be used for intermediate supports on extremely long spans between the terminal pole and the building attachment.

In placing drop spans and ring wiring on poles, care should be taken to locate the drop wire in such a way as to make it difficult for squirrels to gnaw the wire insulation. Many plant men claim that the rodents are especially partial to wires distributed from guard arm hooks and span clamps. They recommend that wires attached to these supporting fixtures be provided with sufficient slack loop back of the drop wire clamps to enable the wire to be bent down and away out of reach of the squirrels.

Spinning Existing Cable To Prolong its Life

AMONG THE troublesome maintenance problems in connection with cable suspended in rings from its supporting strand are ring cutting and crystallization of the cable sheath as the result of bowing. Since ring cutting is produced by the slight rolling motion of the cable in the rings and the bowing is caused by a longitudinal creeping of the cable under contraction and expansion of the strand and cable with temperature variations, the obvious remedy is to lash the cable to its supporting strand by the spinning method. This work can be handled by cable splicers in connection with their daily work at considerable savings in labor charges.

The spinning of existing cable requires more care than the lashing of new cable. Existing cable that has been supported in rings for a number

(Please turn to page 66)

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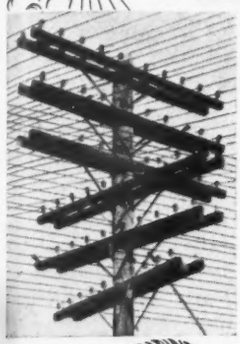

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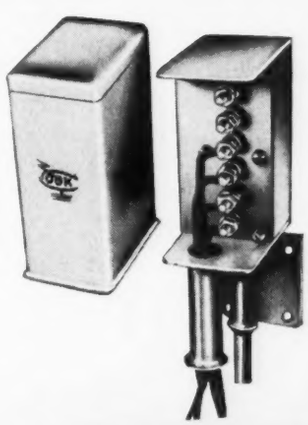

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of years is likely to have become weakened, especially at splice joints as the result of vibrations and stresses. The cable splice sleeves and the adjacent cable will have to be carefully supported during the preliminary maintenance work and the subsequent spinning operation.

The preliminary steps required in preparing the cable for lashing are the following:

(1) Correcting of unsatisfactory condition of the cable supporting structures, such as broken or decayed poles to be replaced and slack to be pulled in guys.

(2) Checking tension of the suspension strand and, if necessary, restoring the proper tension of the strand.

(3) Reversing the position of suspension clamps on poles so that the strand passes through the clamp at the bottom of the through bolt instead of over the bolt.

(4) Inspecting cable sheaths, particularly ends of all sleeves, for damage, and soldering over ring cuts, cracks, and punctures, or replacing badly damaged cable sections where necessary.

(5) Straightening the cable, and, when necessary, placing it under tension.

Strand tension may be measured with a dynamometer, or, less accurately, by means of sag measurements compared with the sags given in *Tables I to III*. If the sags are found to be less than specified, an investigation should be made to determine the conditions at cable dead ends or junction poles that are causing excessive strand tension. For example, the junction pole guy holding the open wire section may have slipped, placing additional tension in the strand. If the sags are found to exceed the specified sags by more than 75 per cent, the cable lead should be examined to detect possible failure of anchors, guys, dead ends, or corners. Any failure of the supporting structures should be corrected.

Table I—Approximate Sag in Inches for Cable on 6,000-lb. Strand—Initial Strand Tension: 1,100 Pounds at 60 Degrees F.

Size of Cable (Pairs)			Deg. Temp.	Sag (in Inches) for Spans of:						
24 Ga.	22 Ga.	19 Ga.	Fahr.	90 ft.	100 ft.	110 ft.	120 ft.	130 ft.	140 ft.	150 ft.
			20	5	6	7	9	10	11	13
25	—	—	60	6	7	8	10	12	13	15
			100	8	9	11	13	14	17	20
			20	6	8	9	11	13	16	18
50	25	—	60	7	9	11	13	14	17	20
			100	8	10	12	14	17	19	22
			20	7	9	11	13	14	17	20
—	50	25	60	8	10	12	14	17	19	22
			100	9	11	13	16	19	22	25
			20	9	11	13	16	19	22	25
100	—	—	60	10	12	14	17	20	24	27
			100	11	14	17	20	24	28	31
			20	10	12	14	17	20	24	27
—	100	50	60	11	14	17	20	24	28	31
			100	13	16	19	23	27	31	36
			20	12	15	18	22	25	30	34
200	—	—	60	14	17	20	24	29	33	38
			100	15	18	22	26	30	35	40

Table II—Approximate Sag in Inches for Cable on 10,00-lb. Strand—Initial Strand Tension: 3,500 Pounds at 60 Degrees F.

Size of Cable (Pairs)			Temp. Deg.	Sag (in Inches) for Spans of:						
24 Ga.	22 Ga.	19 Ga.	Fahr.	90 ft.	100 ft.	110 ft.	120 ft.	130 ft.	140 ft.	150 ft.
			20	8	10	12	14	17	19	22
300	200	100	60	9	11	13	16	19	22	25
			100	10	12	14	17	20	24	27
			20	10	13	16	19	22	25	29
400	300	—	60	11	14	17	20	24	28	31
			100	12	15	18	22	25	30	34
			20	12	15	18	22	25	30	34
—	400	200	60	13	16	19	23	27	31	36
			100	14	17	21	24	29	33	38
			20	13	16	19	23	27	31	36
600	—	—	60	14	17	21	24	29	33	38
			100	15	18	22	26	30	35	40

Table III—Approximate Sag in Inches for Cable on 16,000-lb. Strand—Initial Strand Tension: 5,700 Pounds at 60 Degrees F.

Size of Cable (Pairs)			Temp. Deg.	Sag (in Inches for Spans of:						
24 Ga.	22 Ga.	19 Ga.	Fahr.	90 ft.	100 ft.	110 ft.	120 ft.	130 ft.	140 ft.	150 ft.
			20	10	13	16	19	22	25	29
900	600	300	60	12	15	18	22	25	30	34
			100	13	16	19	23	27	31	36
			20	12	15	18	22	25	30	34
1200	—	400	60	14	17	21	24	29	33	38
			100	15	18	22	26	30	35	40
			20	14	17	21	24	29	33	38
—	900	450	60	15	18	22	26	30	35	40
			100	16	19	23	27	32	38	43

Applying Tension To Cable Prior To Spinning Operation

IN applying tension to the cable prior to the spinning operation, care should be exercised to avoid damaging the cable. The following precautions are helpful in this regard:

(1) All wire ties should be loosened before pulling up the cable.

(2) Slack blocks should be used in preference to chain hoists, to insure that excessive tension will not be placed in the cable, which might open up joints, ring cuts, and incipient cracks in the lead sheath.

(3) The cable should be pulled up only sufficiently to make it lie straight in the rings. If the air temperature is less than 60° F, apply only the required amount of tension indicated below:

Air Temperature in Degrees F	Extent to Which Cable Should be Pulled for each 100 Ft. Length	
	On 6,000-lb. and 10,000-lb. Strand	On 16,000-lb. Strand
60	—	7/16″
50	3/16″	1/2″
40	5/16″	9/16″
30	7/16″	11/16″
20	1/2″	13/16″
10	9/16″	15/16″
0	11/16″	1″

For example: If a 400 ft. length of cable on 6,000-lb. strand is to be lashed and the air temperature is 30°F, the required extent of pull is:

$$400 \div 100 \times 7/16 = 4 \times 7/16 = 28/16 = 1\ 3/4''.$$

(4) Only three spans of cable or less should be pulled up at one time. The cable should not be pulled around

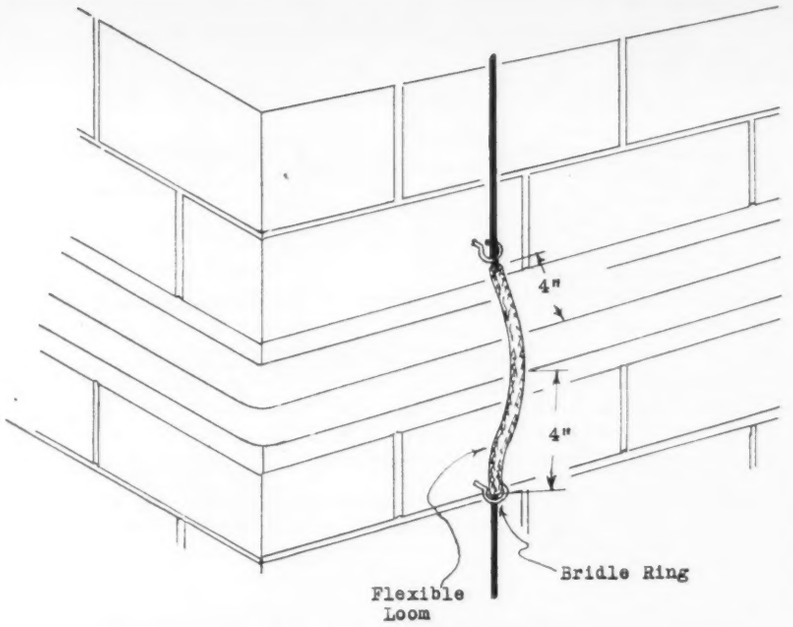

Fig. 9—Use of flexible loom and bridle rings in protecting drop wire run from contact building projection.

a corner; rather, it should be pulled from two directions towards the corner to avoid placing a strain on the cable at the corner supports.

On an extensive cable lashing job, where terminals are to be cut in the cable, all slack should be pulled towards the new terminal locations, so that the resulting slack loops can be cut out when the terminal stubs are spliced in at these points. Under no

(*Please turn to page* 68)

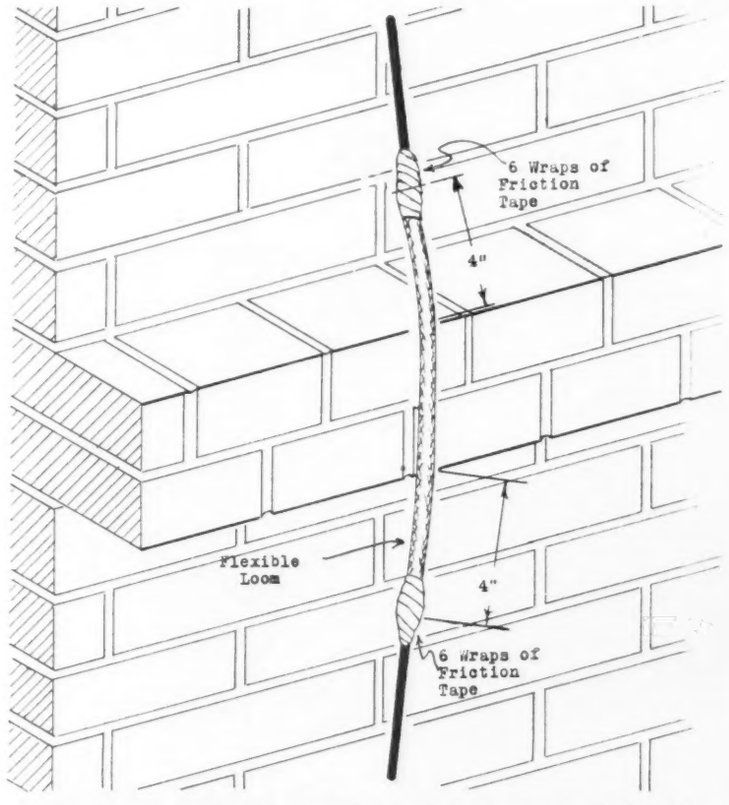

Fig. 10—Using flexible loom held on drop wire by friction tape wrapping to protect wire run from abrasion on building projection.

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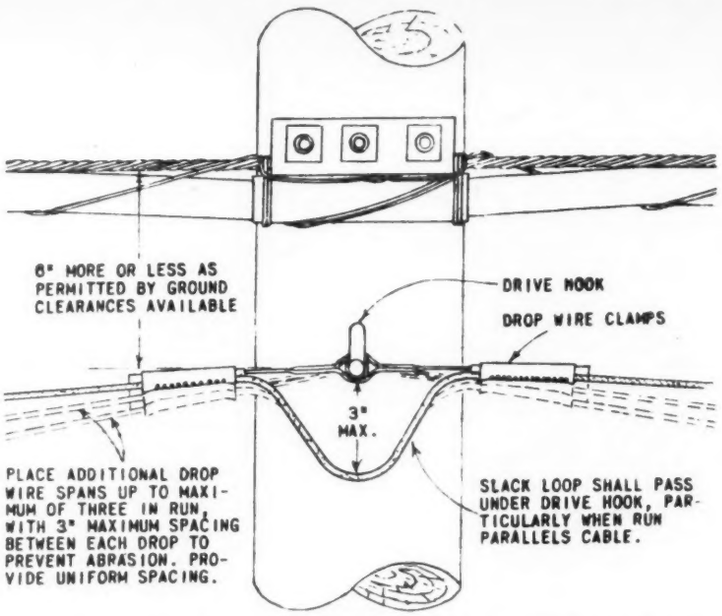
8" MORE OR LESS AS PERMITTED BY GROUND CLEARANCES AVAILABLE
DRIVE HOOK
DROP WIRE CLAMPS
3" MAX.
PLACE ADDITIONAL DROP WIRE SPANS UP TO MAXIMUM OF THREE IN RUN, WITH 3" MAXIMUM SPACING BETWEEN EACH DROP TO PREVENT ABRASION. PROVIDE UNIFORM SPACING.
SLACK LOOP SHALL PASS UNDER DRIVE HOOK, PARTICULARLY WHEN RUN PARALLELS CABLE.

Fig. 11—Provision of slack loop in drop wire between two drop wire clamps at same point of support.

circumstances should slack be left in the cable to be pushed ahead by the lashing machine at the time the cable is lashed to the strand, since this procedure will result in an unsightly appearance of the finished job, because of the bows forming in the cable at this time.

If terminals are not to be cut in the cable, or if there are an insufficient number to take care of any slack

(*Please turn to page* 70)

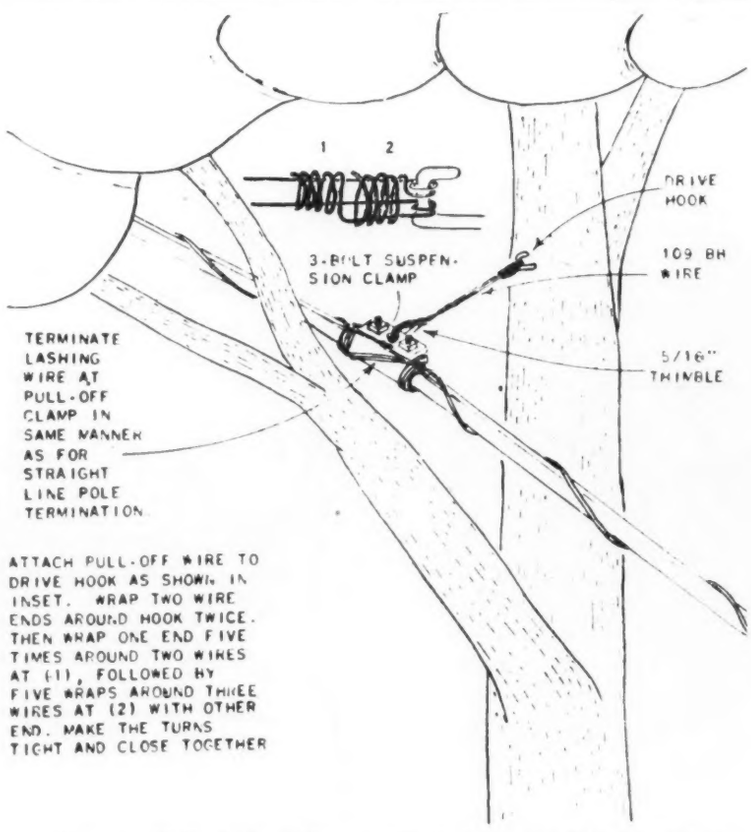
1
2
DRIVE HOOK
3-BOLT SUSPENSION CLAMP
109 BH WIRE
5/16" THIMBLE
TERMINATE LASHING WIRE AT PULL-OFF CLAMP IN SAME MANNER AS FOR STRAIGHT LINE POLE TERMINATION
ATTACH PULL-OFF WIRE TO DRIVE HOOK AS SHOWN IN INSET. WRAP TWO WIRE ENDS AROUND HOOK TWICE. THEN WRAP ONE END FIVE TIMES AROUND TWO WIRES AT (1), FOLLOWED BY FIVE WRAPS AROUND THREE WIRES AT (2) WITH OTHER END. MAKE THE TURNS TIGHT AND CLOSE TOGETHER

Fig. 12—Method of making a pull off to a tree limb to protect cable from contact with the limb.

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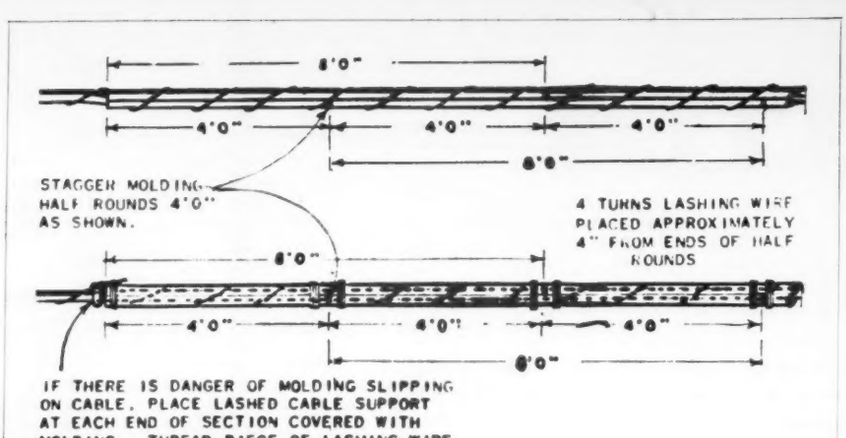
8'0"
4'0"
4'0"
4'0"
8'0"
STAGGER MOLDING HALF ROUNDS 4'0" AS SHOWN.
4 TURNS LASHING WIRE PLACED APPROXIMATELY 4" FROM ENDS OF HALF ROUNDS
8'0"
4'0"
4'0"
4'0"
8'0"
IF THERE IS DANGER OF MOLDING SLIPPING ON CABLE, PLACE LASHED CABLE SUPPORT AT EACH END OF SECTION COVERED WITH MOLDING. THREAD PIECE OF LASHING WIRE THROUGH EYE OF SUPPORT AND UNDER END WRAP. MAKE PIGTAIL AND BEND DOWN OUT OF WAY.

Fig. 13—Use of cable molding. Top—Applied to cable before lashing. Bottom—Applied to cable previously lashed in place.

that develops in the pulling operation, a careful survey of the area in which the cable is to be spun should be made to determine the best locations to store or disperse the slack. Whenever practicable, the cable should be pulled in such a direction that slack can be dispersed at locations where the cable has pulled away as at corners. It may be necessary to pull cable from two opposite directions in order to distribute the slack more evenly and thus dispose of excessive slack at two or more corners, or at least to reduce it to a minimum at these points.

If the excessive slack cannot be dispersed at the points where the cable has pulled away, the following remedies may be resorted to:

(1) Where a slack loop in cable drops the cable more than one foot at any point, the slack should be cut out and the cable respliced. If possible, the slack should be pulled towards an existing splice and a new splice made at this point to keep down the number of splices in the cable.

(2) In the case of a slack loop of one foot or less, the suspension shield of a straight line pole nearest this point may be omitted, if used normally, and the cable looped past the pole. The cable is fastened to the strand with lashed cable supports, one on each side of the pole, and the bottom of the slack loop is fastened to the pole with a lead strap folded around the cable at this point and nailed to the pole.

The spinning procedure is much the same as that used in lashing new cable placed in temporary rings. If short sections of cable are being spun, the lashing may proceed as soon as the cable is ready for the operation. The cable is inspected while lashing and worn or cut places in the sheath are marked for repair with marlin. Where the sheath is broken or a ring cuts through the sheath, the open places should be carefully taped to prevent moisture from entering until permanent repairs can be made.

In extensive spinning of the cable, it is more convenient to have a man ride the cable and remove a sufficient number of rings to leave approximately 10 feet of unsupported cable between rings, care being taken to properly support cable splices and avoid bending the cable at splice joints. The same man inspects the cable and marks bad places in the sheath for repair. As soon as possible thereafter, the cable is straightened and lashed. To avoid the formation of bows in the cable, the cable should not be left unsupported overnight, as it is difficult to remove the resulting waviness.

Two methods of lashing the cable are in general use, the one termed the closed method, and the other, the open method. In the first, the cable is lashed directly to the strand throughout, including splices, suspension clamps, strand splices, and strand dead ends. The uneven places in the strand have lead shields inserted between them and the cable to protect the latter from damage. In the second method, the cable is looped past all interfering points in the strand, lashed cable supports being used to carry the cable past these points. Splices are carried on the strand by means of lashed cable supports on the sleeves, and aerial cable supports are utilized to support the cable near the wiped joints and relieve the stress at the joints. Space does not permit a

(*Please turn to page 72*)

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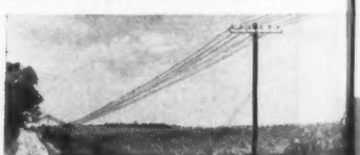
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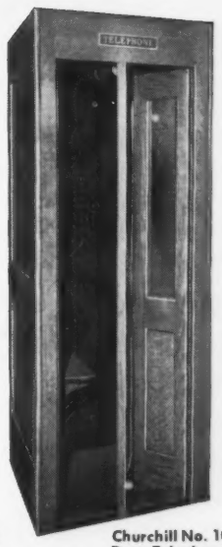

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more complete description of these methods in this article.

Protecting Lashed Cable From Damage

TREES ALONG a cable lead are likely to cause damage to the cable when the trunk or any limb or branch of a tree comes in direct contact with the cable, or when movement of any part of a tree in the wind will cause contact with or transmit vibration to the cable.

Raising or lowering the cable at adjacent poles may provide the desired separation from tree branches in the way, though care should be taken not to reduce clearances from the ground or from foreign wires. In other cases, the position of the cable may be shifted laterally by a pull off to a large limb (*Figure* 12), raking adjacent poles (not joint poles) not more than a few inches, placing cable extension arms at adjacent poles, or by placing tree guards (wood blocks on suspension strand at point of contact with tree branch).

If none of these methods can be successfully used and tree trimming is out of the question, tree molding may be placed as shown in *Figure* 13. The molding should be placed to provide complete protection 3 feet beyond the interfering area on each side. Before placing the molding, the cable sheath should be carefully examined for ring cuts, cracks, and punctures. Any abrasions that may develop trouble later should be soldered over.

The cable molding commonly used for protection is supplied in 8-ft. lengths, consisting of two half-rounds, which are fitted together around the cable. When a section to be protected extends more than 8 feet, the half-rounds are staggered to locate the joints 4 feet apart on the cable as illustrated in *Figure* 13. The recommended sizes of molding for different sizes of cable are shown below:

Size of Molding	Largest Size that can be Covered by Molding: Cable Only PR.	Cable Only GA.	Cable and Strand Together PR.	Cable and Strand Together GA.
3/4"	25	22	—	—
	50	24	—	—
	50	19	25	19
1 1/4"	100	22	50	22
	200	24	100	24
	200	19	100	19
2"	400	22	200	22
	600	24	400	24
	450	19	300	19
2 11/16"	900	22	600	22
	1200	24	900	24

Inspection of Drop Wire and Cable

THIS ARTICLE would not be complete without a discussion of inspection procedures for drop wire and cable plant, which are very important to a successful plant maintenance program.

The purpose of regular plant inspection is to detect unfavorable conditions that may cause damage to drop wire and cable, so that these conditions may be corrected before damage actually results. For convenience and to save time and energy, the two types of plant are included in one survey. This inspection supplements the so-called wet weather line leakage tests with voltmeter or sensitive high speed line insulation test equipment. The elaborate high speed test apparatus is best suited for large exchange testing, but smaller companies may make use of a high resistance ohmmeter with special test cord for plugging into line jacks on switchboards during periods of idle traffic. In the latter case, the test cord is arranged to disconnect the line relay and battery feed to protect the meter and to remove bridged apparatus during the test.

Periodic inspections may be made every two or three years, or oftener.

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The frequency of such inspections depends upon several factors, among them: (1) rate of tree growth in the locality; (2) extent of cooperation of the power company in providing adequate wire clearances and maintaining their own plant in a manner to minimize wire breakages that might cause crosses with telephone wires and cable; and (3) the frequency and severity of storms in the locality. In case of doubt as to the need for an extensive check of the condition of the plant, selected portions of the plant may be inspected to determine if a complete survey of the entire plant is warranted.

Inspection of drop wires is intended to detect the following unsatisfactory conditions:

(a) Inadequate ground clearances and insufficient separation of drop wires from power and street lighting wires.

(b) Excessive tree or shrubbery growths interfering with drop wire spans.

(c) Direct or swinging contacts of drop wires with poles, guys, and other objects that would cause abrasion of the wires.

(d) Interference from building projections, such as awnings, fire escapes, doors, or shutters, that would abrade or damage the wires, as well as be a hazard to people in the building.

(e) Improper wire sags causing either excessively slack or excessively tight spans.

(f) Improperly made wire attachments on buildings, poles, and cable suspension strand, as, for example, insufficient slack loop between drop wire clamps on the same support, insufficient slack in ring runs on poles, and wires exposed to attack by squirrels.

The object of cable inspection is to check the following undesirable conditions:

(a) Inadequate clearances from tree and shrubbery, growths.

(b) Improper sag of cable, denoting a broken pole, slipped dead-end of corner pole guy, or insufficient tension in the suspension strand at the time of its installation.

(c) Ring cuts, cracks, punctures, and crystallized places in the cable sheath.

(d) Bowed cable, rings missing or improperly spaced, insufficient slack due to cable pulling away from corners and terminals on ring supported cable.

(e) Improperly cleated cable ter-

(*Please turn to page* 74)

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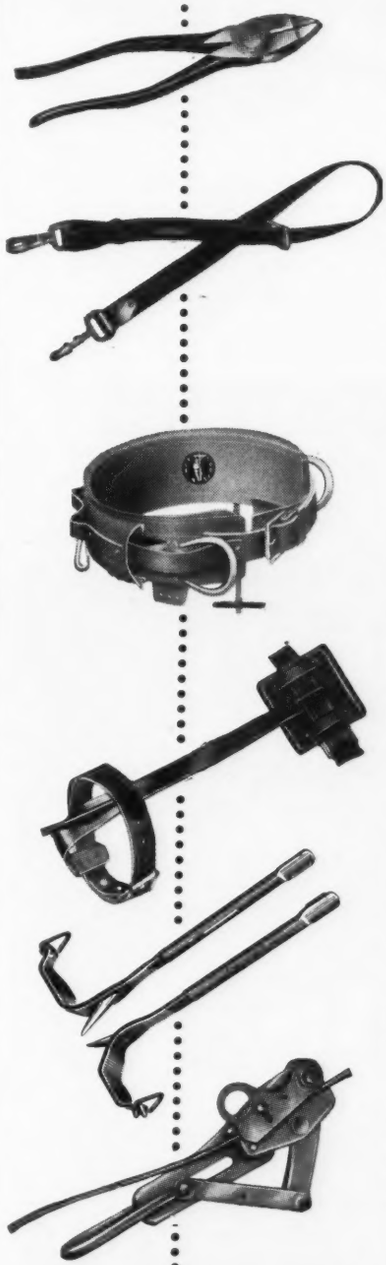

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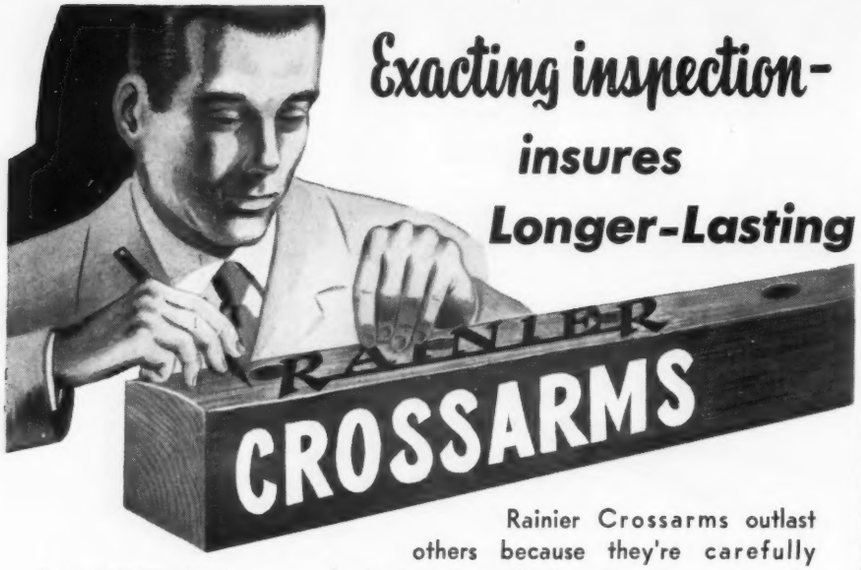

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minal stubs and dirty cable terminal face plates.

(f) Suspension strand corroded or "burned", the latter condition resulting from contact with a fallen power wire.

Since cable trouble is most likely to occur in the section of cable extending for four feet on each side of the poles, it is suggested that each pole be climbed to inspect this section closely. The rest of the span can then be observed from the ground, and, if the appearance of the cable warrants a closer examination, the inspector may use a ladder or ride a cable car to reach the desired points to be examined. Drop wire on terminal poles may be examined at the same time with the cable, cable stub, and terminal.

Notes are made of the defects found and from these notes, instructions are prepared for directing repair crews in correcting the defects. In the case of smaller operating companies, it will be usually more satisfactory to correct undesirable conditions as they are found, the same men handling the inspecting and repairing procedures. Men experienced in cable work would be assigned to the inspection and repair of cable, while combinationmen or construction crews would take care of drop inspection and repair.—THE END

"MIOBA"

(*Continued from page 37*)

(9) When a snag in service is uncovered, the subscriber is notified of the trouble. The repair work is then carried out as swiftly and efficiently as possible, and when it is finished, the subscriber is again contacted and notified that the trouble has been corrected. That means that the subscriber always knows that employees are on the job getting his service restored as quickly as possible. The same is true on reported trouble on party lines where it affects all parties on the line.

(10) Repair service people are doing everything possible to create in the public a feeling of confidence. When a person calls repair service, he should feel sure that he has called the right place to care for the trouble. At most locations the repair people are making definite appointments with the subscriber as to the hour of morning or afternoon that a repairman will call. This has been found to diminish the number of subscribers' subsequent reports as

(*Please turn to page 76*)

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well as to assure access to the telephone if needed.

With the aid of *Mioba*, which is really a barometer indicating how well these procedures are working, a company has a day-by-day system of improving its service to the community.—(*Thanks to the TELEPHONE REVIEW for providing data and photographs on MIOBA for our use.*)

Small Company Talk

(*Continued from page* 61)

but many times it is, to get maximum flexibility in the telephone equipment you buy. The saddest examples of this are switchboards, the ultimate capacity of which are too little. In many cases the difference in cost between a small dial unit capable of expansion to 100 lines and one expandable to 200 lines is negligible. Even if the cost of getting flexibility is considerable, it is usually only a small part of what it would cost extra to start again from scratch.

Cables are the point at which many plans fall down. I suppose it is possible, but I don't believe I ever heard anybody say he put up a cable that turned out to be too large—and on the other hand, I'd hate to have to count all those who have told me that what they put up was too little. The difference in *installed* cost of a 51 pr cable over a 26 is usually less than 50%—for 50% more cost you get 100% more pairs. And if it turns out that the 26 is too small and you have to tear it down and put up larger cable, you have the rearranging or dismantling costs of the old cable as well as the installation costs of the new.

I know all of this is easy to say—and hard to follow. In our own company, we have made most of the mistakes that I have talked about above. After growing to *five times* our size of 8 years ago, we are *just beginning* to visualize the possibilities.

The point is that the growth factor is so vitally important to construction plans as to be almost impossible of over-emphasis. If we are to be restricted by the Washington Alphabetic Agencies in the cause of national defense, we must make sure that the restrictions intelligently accomplish that purpose. When we ask for permission to do certain things, the things that we ask to do should fit into an intelligent program. We hear the word "expedient" used more and more now-a-days. We should not allow it to be applied to

the telephone industry, for, telephonically speaking, expedients accomplish next to nothing, and are costly, temporary, inefficient, and ill designed to accomplish anything more than fleeting relief. Neither should we resort to expedients because they are the simple and easy thing to do.

When the REA Telephone Loan program was being argued, REA proponents said that the small existing telephone companies were "selling the farmer short". In one sense at least they were right. Most small telephone companies during the past five years have not only been selling the farmer short, they have been selling *all* of their possibilities short. And they have not primarily done so because of stubbornness or cream-skimming as the REA advocates accused—they have done so because of an almost universal lack of conception of the growth possibilities. It is, as they say, high time we started grasping that conception.—THE END.

Questions & Answers

(Continued from page 63)

cessity of the other protective coatings. Whether this is justified by results or not it cannot be disputed that the preliminary installation of wrapping and asphaltum film will not do *any harm*.

(5) The use of cable with a wrapping of jute over the sheath and asphaltum varnish over the jute. This is effective in the prevention of corrosion.

(6) The use of cable which has a wrapping of jute and a coating of asphaltum supplemented by an armor of steel tape. This affords the most complete protection against mechanical damage as well as corrosion, moisture or electrolysis.

There are some general considerations that are important in the consideration of methods for installing buried cable. When the cable is to be laid in soil that is *made land* that contains considerable trash and ashes, when it is near toilets or locations in which the drainage is not good careful study of the plan is indicated. In case of doubt it would be well to have samples of the soil in which the cable is to be placed analyzed by your State authorities from the viewpoint of its suitability for buried cable. The cost of a given run of buried cable will ordinarily be comparable with the cost of aerial cable. The accounting, however, is somewhat different. Since buried cable cannot be withdrawn and replaced by larger cable it is very much subject to careful initial engineering. As the cable continues in service it can be used for only a definite number of circuits and for that reason its service life may be different from ordinary underground cable in conduit.

These comments relate to the use of some type of lead sheath cable of the conventional type. Some of the new plastic cables offer possibilities that may be found worthy of careful consideration.

In installing buried cable the provision of terminal points with laterals calls for the most careful preliminary study. This is because city distribution calls for branch splices at each terminal and in any event some type of manhole or handhole will preferably be installed to provide access to the main cable. In city plant some system of markers must, it would seem, be provided for this reason.

QUESTION: We have noted the statement, in the discussion of "The Voltmeter for Telephone Line Circuit Maintenance", TELEPHONE EN-

(Please turn to page 78)

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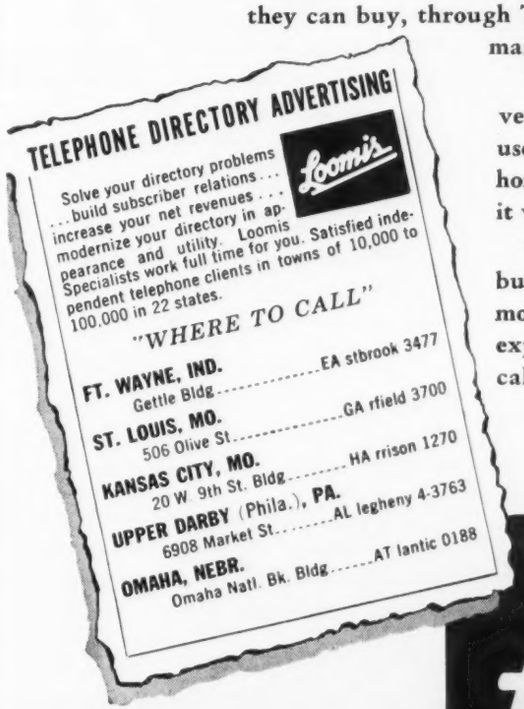
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GINEER AND MANAGEMENT, issue of February, 1951, that several shunts may be utilized advantageously. In view of this possibility we would like to arrange at least one additional voltmeter shunt so that resistances ranging from 0 to 1,000 ohms could be quickly checked with sufficiently close accuracy for ordinary maintenance purposes. Such resistances would be found in relay windings, induction coils, repeating coils and some ringer coils to mention a few typical items. Our voltmeter is a good one with an internal resistance of approximately 100,000 ohms and a 125 volt scale. The storage battery in our office will be used with any such new shunt. It is

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intended to maintain a uniform voltage at the bus-bars of 50 volts. We have had some little difficulty in solving the equation given and would appreciate it very much if a formula might be published which we could apply to problems of the kind directly. Thank you.

ANSWER: The formula requested is given below. The following factors are assigned the conventional characters listed.

R The resistance of the maximum loop external to the voltmeter
r The internal resistance of the voltmeter
E The exact battery voltage
e The indication of the voltmeter for the maximum external loop (expressed in *amperes*)
x The resistance of the shunt (the unknown quantity)

In the specific problem given the following are the values of these conventionals.

R 1,000 ohms
r 100,000 ohms
E 50 volts
e 2 (0.00002 amperes)

The formula is as shown below:

$$x = \frac{eRr}{E - eR - er}$$

Substituting, this becomes:

$$x = \frac{(0.00002)\ (1{,}000)\ (100{,}000)}{50 - 0.02 - 2.0}$$

or $\frac{2{,}000}{47.98}$ or 41.68 ohms

The formula is precisely equal to the equation given on page 46 of the February issue of TELEPHONE ENGINEER AND MANAGEMENT.

Materials

(*Concluded from page 43*)

During periods of scarcity, this knowledge may suggest a plan which will solve a specific problem involving either methods or materials.

The question of substitutes has not been explored in this article because it is appreciated that the manager of the small company which, because of size has no engineering or research department, is dependent upon manufacturers and large companies for the development of substitutes. Suffice it to state that the small operator should keep in mind that from time to time he may have an opportunity to meet a shortage problem through a minor change in his own specifications. He should therefore consider every problem of scarcity in that light.

As I stated at the outset, solving problems is both "old stuff" and at the same time "new stuff" to managers of businesses. We know from our experience that the sooner we start doing something about finding a solution, the sooner will the solution be found, which means that even though we don't know how long a period of scarcity is ahead of us, we cannot afford to delay in developing our individual programs. THE END.

Washington

(*Continued from page 29*)

by the NARUC-FCC joint staff group to study the following problems: survey of methods to arrive at uniformity of toll rate schedules; the toll component; the exchange component; and analysis of changes in separations methods which may be necessary in view of technological advancements.

Four subcommittees were set up by the NARUC-FCC joint staff group to study the following problems: survey of methods to arrive at uniformity of toll rate schedules; the toll component; the exchange component; and analysis of changes in separations methods which may be necessary in view of technological advancements.

Any final decisions on tests of revised or new separations procedures will take considerable time, but it is still anticipated that the FCC's hearings on interstate telephone rates, scheduled for Aug. 20, may be avoided.

FCC Reports Public Not Using "Beep" Tone Signal

THE EFFORTS of the FCC to convince the public that it should use recorder-connectors installed and maintained by telephone companies when telephone recorders are used have not been too successful, it has been indicated in letters from the Commission to the U. S. Independent Telephone Association and the American Telephone & Telegraph Co.

The Commission reported that an informal investigation indicates that there have been "widespread violations" of the recording device tariff provisions, calling for the use of the recorder-connectors with their "beep" tone warning signal every 15 seconds. It called on the Bell System and Independent telephone companies to take measures "to assure vigorous enforcement by the telephone industry of the applicable tarriffs."

In its letters, the agency also noted that no provision is made in the tariffs for use of inductive-type recorders, as "no tone warning device has

(*Please turn to page 80*)

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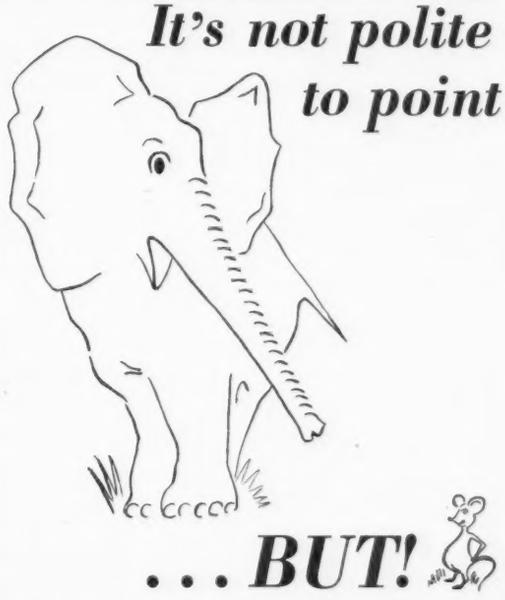

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yet been developed which is able to give a warning tone on the telephone circuit when being used with an inductive type recorder."

There has been something less than heavy public demand for the recorder-connectors, it was brought out recently. In hearings before the Commission in another foreign attachment case, on automatic telephone answering devices, a Bell System witness said that the companies he represented have installed only about 4000 of the connectors since the FCC requirements went into effect about two years ago.

In the answering device case, incidentally, the hearings have been wound up after piling up a transcript which runs to about 2500 pages, not including depositions and exhibits. Briefs and proposed findings are due in the case, in which manufacturers of various answering devices are trying to have the FCC throw the field open for use by the public of any answering device, by June 1.

It had been announced during the sessions that the Ohio Bell Telephone Co. had decided to go ahead and offer automatic answering service on an experimental basis, using the Peatrophone, 200 units of which have been acquired by the Western Electric Co. Since then, the Ohio Public Utilities Commission has approved the offering of the services.

During tests of the various answering devices conducted by the FCC staff, it was reported at the hearings, the Peatrophone came off with the best statistical performance. Recordings of telephone messages left with the Peatrophone showed the highest ratio of intelligibility of any of the devices tested by the Commission staff in "talker-listener" tests.

Stromberg-Carlson Credit Corp. Organized

ROBERT C. TAIT, president of Stormberg-Carlson Co., Rochester, N. Y. has announced the formation of a new subsidiary to be known as Stromberg-Carlson Credit Corp., through which complete financing can be arranged for dial conversions, expansion, rebuilding and modernization of plant for small Independent telephone companies.

Some 18 months ago, Mr. Tait directed that a complete study be made of the problems of small companies and a report be prepared recommending some solution to their financial difficulties. The results were summarized in a letter prefacing the

(*Please turn to page* 83)

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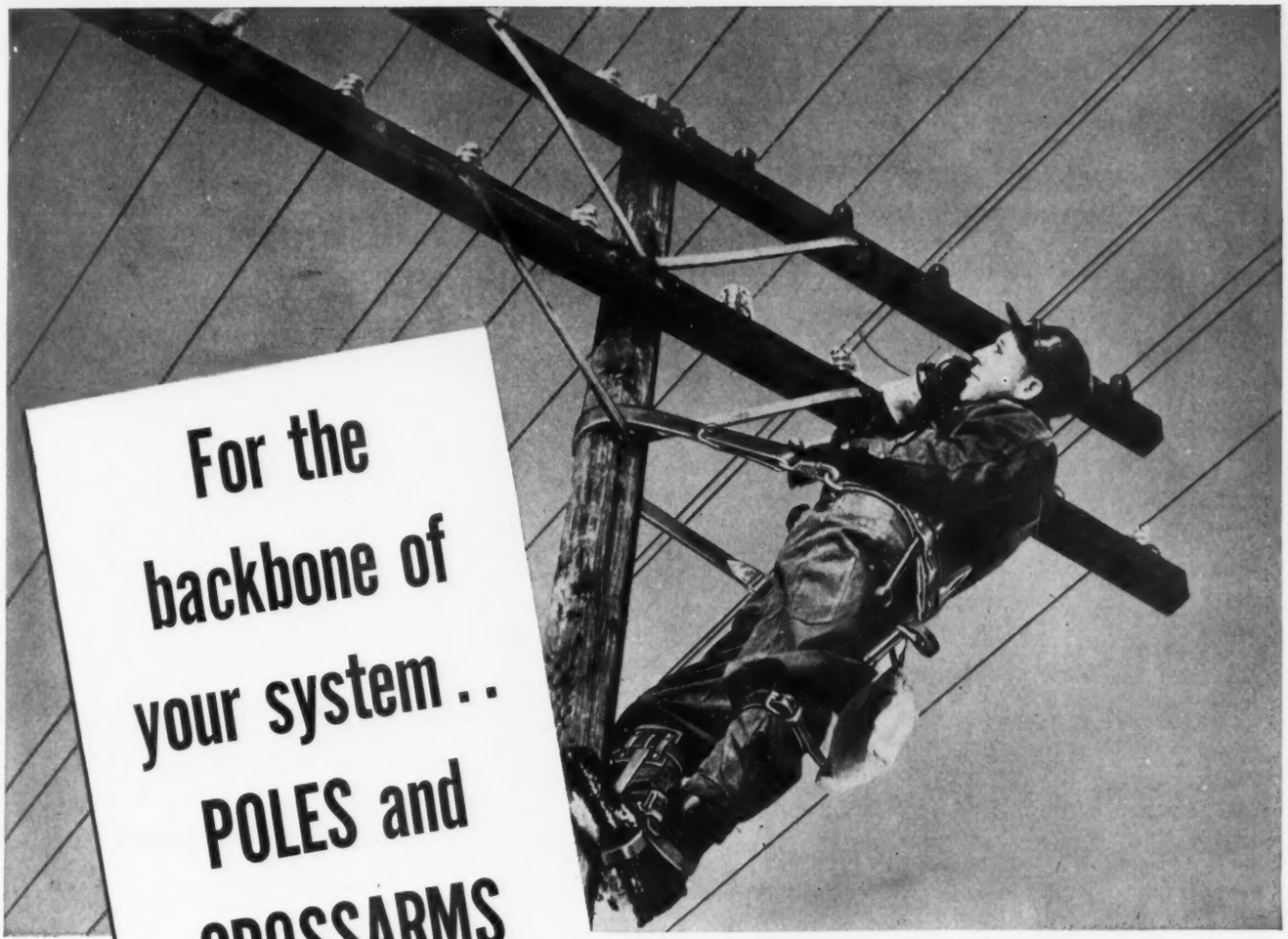

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CROSSARMS – Douglas fir crossarms via Graybar are selected and seasoned under rigid methods – are strong, long-lasting, and provide a wide margin of safety in the line.

POLE-LINE SUPPLIES – Graybar also distributes insulators, wire, cable, strand, hardware, tools, and hundreds of other first-line telephone supplies – all products of outstanding manufacturers.

To keep the backbone of your system strong, order your supplies from Graybar. You'll always get dependable items, and the nation-wide Graybar warehouse system helps assure the *fastest possible* deliveries under today's uncertain conditions.

For help in solving any of your *other* electrical problems, remember too, that the services of a Graybar Telephone Specialist are available through our nearest office. *Graybar Electric Company, Inc. Executive Offices: Graybar Bldg., New York 17, N. Y.*

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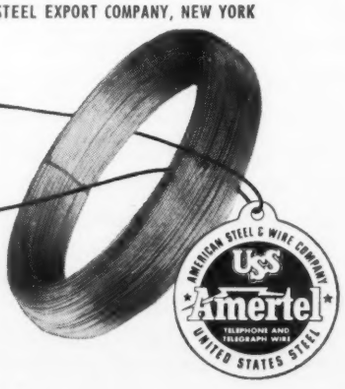

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Phillip J. Lucier, manager of Stromberg-Carlson Credit Corp.

report in which he said, "For some years the Stromberg-Carlson Company has been increasingly aware of the problems facing Independent telephone companies in locating sources of long-term capital for expansion and modernization of plant facilities. As a key manufacturer we observe daily case after case where all the elements of successful and profitable operation in the independent telephone field are present except for adequate financing. A step toward the solution of this problem is the formation of the Stromberg-Carlson Credit Corp."

The purpose of the new corporation is to make funds available for purchase and installation of new dial or

(Please turn to page 85)

Randolph J. Shoemaker will handle appraisal and engineering work of Stromberg-Carlson Credit Corp.

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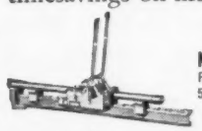

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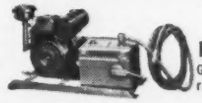

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Mr. Tait announced the appointment of Phillip J. Lucier as Special Financial Representative to handle loan applications. Lucier will also be Manager of the Stromberg-Carlson Credit Corp. Randolph D. Shoemaker, National Sales Engineer, has been designated for appraisal and engineering work in the program. Additional personnel will be assigned at a later date.

Officers and Directors of the newly formed Stromberg-Carlson Credit Corp. are Gordon G. Hoit, President; Arthur F. Gibson, Vice President; Charles W. Pritchard, Treasurer; Edwin C. Roworth, Secretary, and Robert C. Tait.

Schauer Mfg. Corp. To Build Plant In Cincinnati

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(*Please turn to page* 90)

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Here's the handiest, most cost-saving protector you can use to terminate a small number of cable pairs. Can be mounted on pole or directly on building, where it eliminates subscriber drops. Installation is an easy one-man job! Detachable mounting bracket is bolted in position before terminal is placed, and reversible cover permits leading cable in from top or bottom. Each protector pair consists of two Type 17 wood fuses and two positive-grounding discharge blocks with .0055" gaps. Flat shape of terminal (7¼" x 4¾" x 14") enables lineman to climb past easily.

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FOR SALE—Small Telephone Exchange in Northern Wisconsin. 190 telephones, mostly new. Also 1 Western Electric High Shelf Switchboard, 105 drops. Exeland Telephone Co., Box 26, Exeland, Wisconsin.

FOR SALE: 500 used Stromberg-Carlson #1155 steel wall telephones @ $3.50 ea. 500 used Stromberg-Carlson #1156 steel wall telephones @ $2.50 ea. Frequencies: straight line, 16⅔, 33⅓, 50, 66⅔ cycles. Write Box No. 8699 c/o Telephone Engineer.

FOR SALE—530-station magneto and 170 dial exchanges. Modern 8-room house. Expansion territory. Whiteford Farmers Telephone Company, Ottawa Lake, Michigan.

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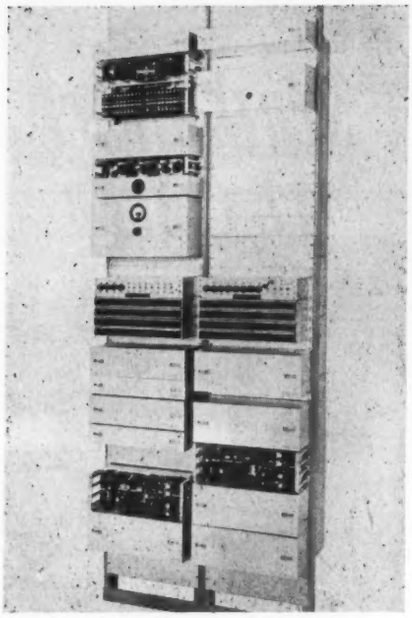

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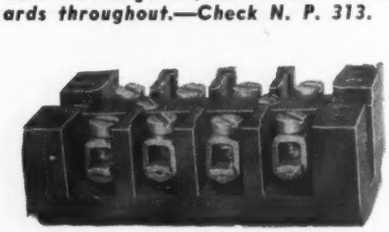

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CROSS ARMS—American Cross-Arm, Inc., 141 W. Jackson Boulevard, Chicago, Ill.—[ADV. 18]

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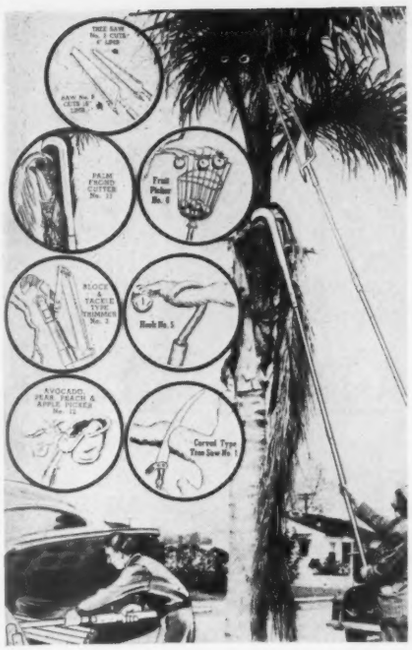
POLE HOLE DIGGERS—For derrick mounted trucks. Tel-E-Lect Products, Inc., 9613 Minnetonka Blvd., Minneapolis 16, Minn.—[ADV. 32]

POLES—Cedar poles and Fir cross arms. R. G. Haley & Co., Inc., Spitzer Bldg., Toledo 4, Ohio.—[ADV. 33]

POLES, Southern Yellow Pine—Colfax Lumber & Creosoting Co., Inc., P.O. Box 23, Pineville, La.—[ADV. 34]

POLES, Creosoted Southern Yellow Pine and Douglas Fir. The Long-Bell Lumber Company, Wood Preserving Div., R. A. Long Bldg., Kansas City, Mo.—[ADV. 35]

POLES, Southern Yellow Pine—Taylor Colquitt Company, 290 E. Main St., Spartanburgh, S. C.—[ADV. 36]



INSULATOR POLE:—*The J. B. Sebrell Corp., manufacturers of pruning poles, tree trimmers and light weight sectional aluminum poles, has announced a new development in tree pruning equipment; the insulator pole which is a plastic section of pole 4 feet long and 1½ inches in diameter.*

The manufacturer claims: (1) the insulator pole is safer than wood around power lines; (2) it will not splinter, crack, chip or break under normal usage, and (3) its weight is only one-third that of wooden poles.

The Sebrell Corp. has manufactured light weight, sectional aluminum and magnesium poles for years. These poles may be joined together to form poles 60 feet long, yet can be broken down into twelve 5-foot sections.

The insulator poles may be joined to aluminum or wooden poles or they may be joined together by using a special sleeve aluminum connecting unit. The manufacturer claims poles of this type are almost electrocution-proof under normal conditions, as the special plastic material of which they are made has proved to be one of the best insulators obtainable.

A free illustrated booklet on "How NOT to Prune Trees," pointing out different common mistakes, as well as the proper pruning technique will be mailed upon request. Illustrated in this booklet are the latest improved pruning tools manufactured by the J. B. Sebrell Corp.—Check New Product 315.

POLES, Southern Yellow Pine—Texas Creosoting Co., Orange, Texas.—**[ADV. 37]**

POLES—Texas Best pressure-creosoted poles, Lone Star Creosoting Co., P. O. Box 9, Longview, Texas.—**[ADV. 38]**

POLES—Western Red Cedar, Western Larch, Lodgepole Pine. B. J. Carney & Co., Minneapolis 3, Minn. and Spokane 8, Wash.—**[ADV. 39]**

POLES & CROSS ARMS—Creosoted poles and crossarms. Conroe Creosoting Co., Conroe, Texas.—**[ADV. 40]**

PROTECTIVE EQUIPMENT—Reliable Electric Company, 3145 Carroll Avenue, Chicago 12, Ill.—**[ADV. 41]**

GAS-TITE CABLE TERMINALS—Sub station protectors, main dist. frames; central office protectors; interior junction boxes; lightning arrestors.—Cook Electric Co., 2700 Southport Ave., Chicago 14, Ill.—**[ADV. 42]**

PRINTING—Telephone forms, Cullom & Ghertner Co., 600 21st Ave., Nashville 4, Tenn.—**[ADV. 43]**

REBUILT TELEPHONE EQUIPMENT—USED EQUIPMENT BOUGHT AND SOLD—Independent Telephone Repair Co., 2137 W. 21st St., Chicago 8, Ill.—**[ADV. 44]**

REBUILT TELEPHONE & SWITCHBOARDS—Telephone Repair & Supply Company, 1760 Lunt Avenue, Chicago 2, Ill.—**[ADV. 45]**

SUPPLIES—New all metal heavy duty extension loud ringers; ready wire reels, payout only and payout and takeup in one.—Suttle Equipment Co., Lawrenceville, Ill.—**[ADV. 46]**

TELERING—Telephone ringing by frequency conversion. Voltage range for all purposes, central office and private branch exchanges. Telkor, Box 186, Elyria, Ohio.—**[ADV. 47]**

SWITCHBOARDS, TELEPHONES, ETC.—Automatic Electric Co., 1033 W. Van Buren St., Chicago, Ill.—**[ADV. 48]**

SWITCHBOARDS, TELEPHONES, ETC.—The North Electric Manufacturing Company, Galion, Ohio.—**[ADV. 49]**

TRUCK BODIES—Highway Trailer Co., Edgerton, Wisc.—**[ADV. 50]**

TRUCK BODIES AND EQUIPMENT—McCabe Powers Auto Body Co., 5900 N. Broadway, St. Louis 15, Mo.—**[ADV. 51]**

WIRE DROP & INSIDE—Jackets of neoprene, rubber or plastic. Lowell Insulated Wire Co., Lowell, Mass.—**[ADV. 52]**

WIRE, Insulated—DATED DROP WIRE—Neoprene or Weatherproof—Alphaduct Wire & Cable Co., Milltown, N. J.—**[ADV. 53]**

WIRE, Insulated Drop and Bronze or Copperweld—Acorn Insulated Wire Co., Inc., 36 Freeman St., Pawtucket, R. I.—**[ADV. 54]**

***"IMPAKDRIVER"**—Especially designed by the H. K. Porter Co., the new "Impakdriver" is a handy tool for loosening or tightening bolts in hard-to-get-at places. According to the manufacturer the "Impakdriver" successfully handles the problem screws, bolts or nuts that must be turned and eliminates time wasted in attempts to use screwdriver, wrench, cold chisel or hacksaw.—Check New Product 316.*

WIRE, Insulated Drop, Genuine Ironite—Paragon Electric Co., Two Rivers, Wis.—**[ADV. 55]**

WIRE, Insulated Drop, HT Bronze, Paraprene or Braid Insulation—Paragon Electric Co., Two Rivers, Wis.—**[ADV. 56]**

WIRE, TELEPHONE, for all inside and outside uses—Whitney Blake Company, New Haven, Conn.—**[ADV. 57]**

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Please forward complete information on the following products and services described in the April, 1951 issue of TELEPHONE ENGINEER AND MANAGEMENT. (Check information desired.)

NEW PRODUCTS

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Company .....

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tive Test Equipment, has completed plans for the construction of a new plant in Cincinnati.

According to A. J. Kohn, president, the structure will be of the one floor plant type and will be located on 10 acres of ground. Construction will start immediately and the new plant is to be ready for occupancy this Fall.

G. L. Nord, vice-president and chief engineer of the Schauer Corp. stated "the continually increasing demand for the entire line of Schauer products has made it necessary for us to seek larger and more modern plant facilities. With three separate manufacturing divisions, each requiring separate assembly areas, our present location is rapidly becoming inadequate. The new building is designed to meet our production requirements exactly."

Artisan Products, Inc. Changes Name

THE BOARD OF DIRECTORS of Artisan Products, Inc., Cleveland, Ohio, builders of Utility Service Truck Bodies, have changed the corporate name effective April 15, 1951 to Stahl Metal Products Inc.

E. J. Stahl, formerly executive vice-president of Baker-Raulang Co., has been elected chairman of the board. Officers of the Stahl Metal Products, Inc. have been re-elected as follows: C. J. Stahl, president, John Hay, vice president and secretary, W. A. C. Miller III, treasurer.

The Board of Directors have also approved a plant expansion program immediately in order to take care of the company's increased volume of business.

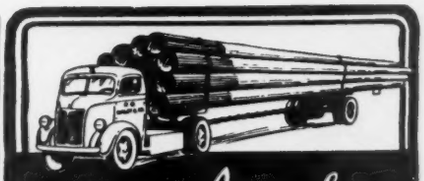
Two Sizes Added To Pengo Auger Line

TWO NEW SIZES of the twin-helix "Pengo" Earth Augers, one for 10" and the other for 12" actual hole diameters, are now in production by Petersen Engineering Co., Santa Clara, Calif.

The complete "Pengo" line now consists of 11 auger sizes for hole diameters from 10" to 36". The augers are made to fit Highway, Williams and Trackson earth boring machines; adapters to make the augers interchangeable on these and other makes of machines are available.

The "Pengo" auger bores holes of diameters specified, avoiding waste of concrete when drilling for tower

(*Please turn to page* 92)



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FROST EARTH AUGER*

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It will drill through flint-hard Frozen Earth, Shale, Sandstone, Gumbo, Clay, Gravel, and Dry Hard Packs.

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HENNING ELECTRIC MOTOR COMPANY

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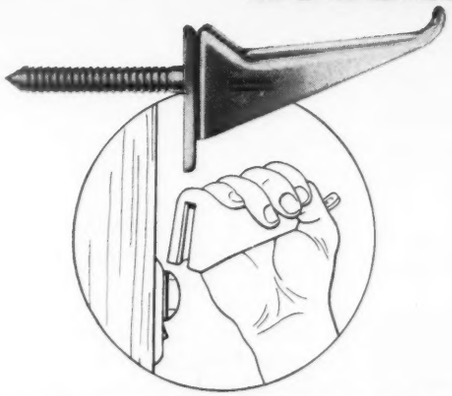
FARGO, NORTH DAKOTA

HUBBARD POLE STEPS...



No. 7235 Lag and Plate and No. 7236 Detachable Step are designed to prevent unlicensed climbing. The plate is slipped over the head of the lag and is prevented from turning by a lug in the lower part of the plate.
‡A.A.R. Std. *Western Union Std. †E.E.I. Std.

DESIGNED FOR SAFETY

Hubbard Pole Steps are designed to carry the heaviest human load and to withstand all normal conditions in use, with an ample safety reserve. They are forged from new Open Hearth Steel and bend tests are made periodically, after galvanizing, to check malleability and freedom from embrittlement. All Hook Head Steps have fetter drive threads and marking rings, which indicate proper installation depth and provide a tight seal against water seepage. See Hubbard Catalog No. 50, page 42, for the full line of Hubbard Steps for wood and metal poles, towers and concrete poles.

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ESTABLISHED 1843
PITTSBURGH • CHICAGO • OAKLAND, CALIFORNIA
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Their long life assures low per annum cost lines—proven by ten years use.

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These practical insulators are hand-tested for accuracy of thread contours. They're tested for resistance to thermal shock, too. Mechanical tests and field service have proved that these insulators support loads that bend standard mounting pins.

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Armstrong's No. 1

ARMSTRONG'S GLASS INSULATORS

for communications . . . for power

footings or cast-in-place piles or footings. In addition to drilling ordinary ground, it is claimed that the "Pengo" auger will bore holes in hardpan, permafrost and frozen ground, decomposed rock and some kinds of caliche and sandstone. The twin-helix design of the "Pengo" auger eliminates back thrust against the side of the hole, making it possible to drill with less caving in sandy soil.

Each half helix is equipped with a shank plate, each of which is provided with replaceable cutting points of abrasion-resistant alloy steel. Maintenance costs are said to be substantially reduced because wear takes place on the inexpensive replaceable cutting points and pilot bit where wear is intended to take place instead of on the auger itself. Trips to the shop for welding or repairs are eliminated.

Full information may be obtained from the manufacturer, Petersen Engineering Co., 460 Kifer Road, Santa Clara, Calif.

Arnold & Fischer Named Koppers Vice Presidents

APPOINTMENT of Walter P. Arnold and Frank H. Fischer as vice presidents in the Wood Preserving Divisions of Koppers Company, Inc., has been announced by General Brehon Somervell, president of Koppers.

Mr. Arnold has been executive assistant to H. R. Condon, vice president and general manager of the Wood Preserving Division since April, 1950, and Mr. Fischer was named assistant general manager of the division in charge of activities in eastern United States at the same time.

A native of Cincinnati, Ohio, Mr. Arnold was awarded a degree in Chemical Engineering by the University of Cincinnati. He joined Koppers as a chemical engineer at its Orrville, Ohio, wood treating plant in 1925, and ten years later became technical director for the Wood Preserving Division. He entered the Pittsburgh general offices in 1946 as manager of railroad sales for the Division and still is responsible for this phase of activities.

Mr. Fischer is a native of Pittsburgh. He joined a predecessor company of Koppers in 1919, holding positions as purchasing agent and assistant sales manager. When this company became a part of Koppers Wood Preserving Division, he was appointed district sales manager for that Division.

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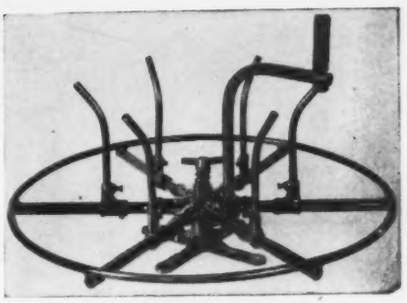

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The Suttle reel with the take-up handle provides six adjustable forks to make a round coil when taking down used wire. Ideal for salvaging that used wire you may need next winter.

For Stringing or Taking Up All Telephone Wires

Suttle Wire Reels

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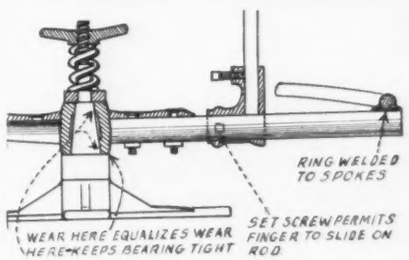
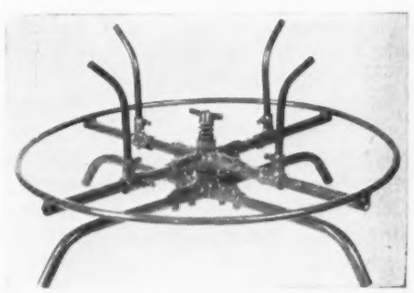


It Never Wobbles

The cone-bearing feature on Suttle reels prevents spindle wobble even after years of wear because the socket slides up on the cone as it wears.



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Serving Independent Telephone Men Since 1910

Suttle EQUIPMENT CO.

LAWRENCEVILLE ILLINOIS

THE BACK OF THE BOOK

"No Bookie Business..."

by John G. Reynolds

Where the use of the telephone for bookmaking is concerned, there is one safe bet—the telephone industry does not want any part of bookie business!

AFTER THE Kefauver hearings took to the television channels, Americans soon became familiar with the fact that *Win*, *Place* or *Show*, are choices for horseracing bettors and increasingly aware that there is one positively safe bet—*the telephone industry does not want any part of bookie business.*

It has long been an industry policy to refuse to install, or to disconnect telephone service where the company has reasonable cause to believe that the service is being or will be used for illegal purposes. Tariffs even prohibit the use of telephone facilities for unlawful purposes.

A recent article in *Pacific Telephone Magazine* points up the fact that it is not always possible to avoid installation of telephones which ultimately are put to unlawful uses. There are a good many times when telephones for such purposes are obtained through trickery and subterfuge. However, through cooperation with law enforcement agencies, these telephones are ferreted out and disconnected immediately.

Often the subterfuges are recognized by telephone people who, in the process of taking orders for service or visiting the premises to make the installation, sense that things are not what they seem.

Here's an example of how an alert installer helped avert illegal use of service. Three telephone lines over a bakery were requested. To all appearances, the little shop in a residential district was just another good place to buy pies and doughnuts. A tempting smell of hot rolls floated through the door. But the installer smelled something else. He reported the request to the chief special agent, who turned the case over to the police. Upon investigation, the shop was found to be a blind for bookie operations and three men were arrested.

In another case, two extra lines ordered for a small residence, which could be adequately served by one telephone, aroused the suspicion of another plant man. On investigation by the authorities, a notorious bookie joint was uncovered.

As a guide to the detection of illegal use of service, three points are important: *the history and business of the applicant; type of service requested; location for the installation.*

Upon searching a vagrant picked up by the police in a routine round-up recently, evidence was found indicating that the man had business connections with a bookmaking establishment. Vice squad officers determined the location of a bookie's telephone from a number found in a man's pocket and made plans to raid the place. The "spot" turned out to be a grocery market with two business telephones in an unoccupied back room. There was no indication of illegal activity in the so-called "office". One of the officers lifted the receiver.

"*Hi, Joe. Sam. Gimme five bucks across the board on Pink Lady in the fifth. See ya later.*"

The officers promptly called the chief special agent to request that a check be made on the installation. Investigation by the special agents revealed that some one had surreptitiously run 1,000 feet of drop wire from the store building, through an alley "ring run" on a building and on poles, entering the top of a six-story office building on another street. At the end of these drop wires were unauthorized installations in a soundproof room. The vice squad moved in and two more bookies went to jail.

There have been many instances where the telephone company has installed a residence telephone on one floor of an apartment house and later discovered that it has been illegally moved to another floor. Jumpers are removed from the original location to other locations. When discovered, the service is disconnected.

Another variation: a customer, who had a nonpublished telephone in a downtown building, was listed as a furniture broker. He gave an order to disconnect the telephone in his downtown office and connect it at his home in one of the better residential sections of the city. Shortly after this was done, the company received an order for two more nonpublished telephones at the same residence. While the installer was making the installations, he heard the customer receiving and relaying race track results by telephone. As part of their training, installers and service representatives are told to be on the lookout for illegal use of facilities and this installer reported what he had heard. All telephone service was disconnected and a report was made to the appropriate law agency.

It is important to understand that the telephone company and its employers are not criminal investigators, and cannot assume any functions of law enforcement. Employees are expected to exercise good business judgment in accepting or denying applications for service and to cooperate with the constituted authorities in preventing illegal use of service. The constituted authorities—the police, sheriffs, district attorneys, etc., have been warm in their praise of the effective cooperation given them by telephone people in enforcing the law. They realize the telephone industry wants no part of bookie business. They know that when a company discovers its service being used in bookmaking transactions, the service is terminated. That is industry policy. Employees understand it, believe in it and live up to it in all company operations.

The LORAIN SUB-CYCLE RT-UNITS

PACKAGED POWER for P.B.X. and SMALL SWITCHBOARDS

R Stands for ringing. T stands for talking. An "RT-UNIT" combines in one cabinet both ringing and talking power supply.

12 NEW MODELS in 5 CABINET SIZES

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3½ Watts, 20 Cycles
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+.87 amp 14-28V. DC Supply for talking
+.5 amp unfiltered DC for signalling
+10 ±1V. and 20 V. ±2V.
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2 amp 24 or 34 V. DC for talking supply

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3½ Watt 30 Cycle BC self-starting Sub-Cycle
All other features same as Model RT-1 but less expensive

MODEL RT-4
3½ Watt 30 Cycle BC self-starting Sub-Cycle
All other features similar to Model RT-2 but less expensive

T-UNITS

DC POWER SUPPLY PROVIDES

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0.87 amp 14-28 V. DC for talking

MODEL T-2
2.0 amp 24 or 34 V. DC for talking

MODEL T-3
0.5 amps 22-30 V. DC for talking

MODEL T-4
1.0 amp 40-52 V. DC for talking

MODEL T-5
0.5 amp 10-16 V. DC for talking

MODEL T-6
1.0 amp 5.8 V. DC for talking

SUB-CYCLE

RINGING POWER SUPPLY
BIASED-CORE (BC)

Self-starting, protected on overload
Model BC-30X – 50 ma. 30 Cycles 100-115 V.
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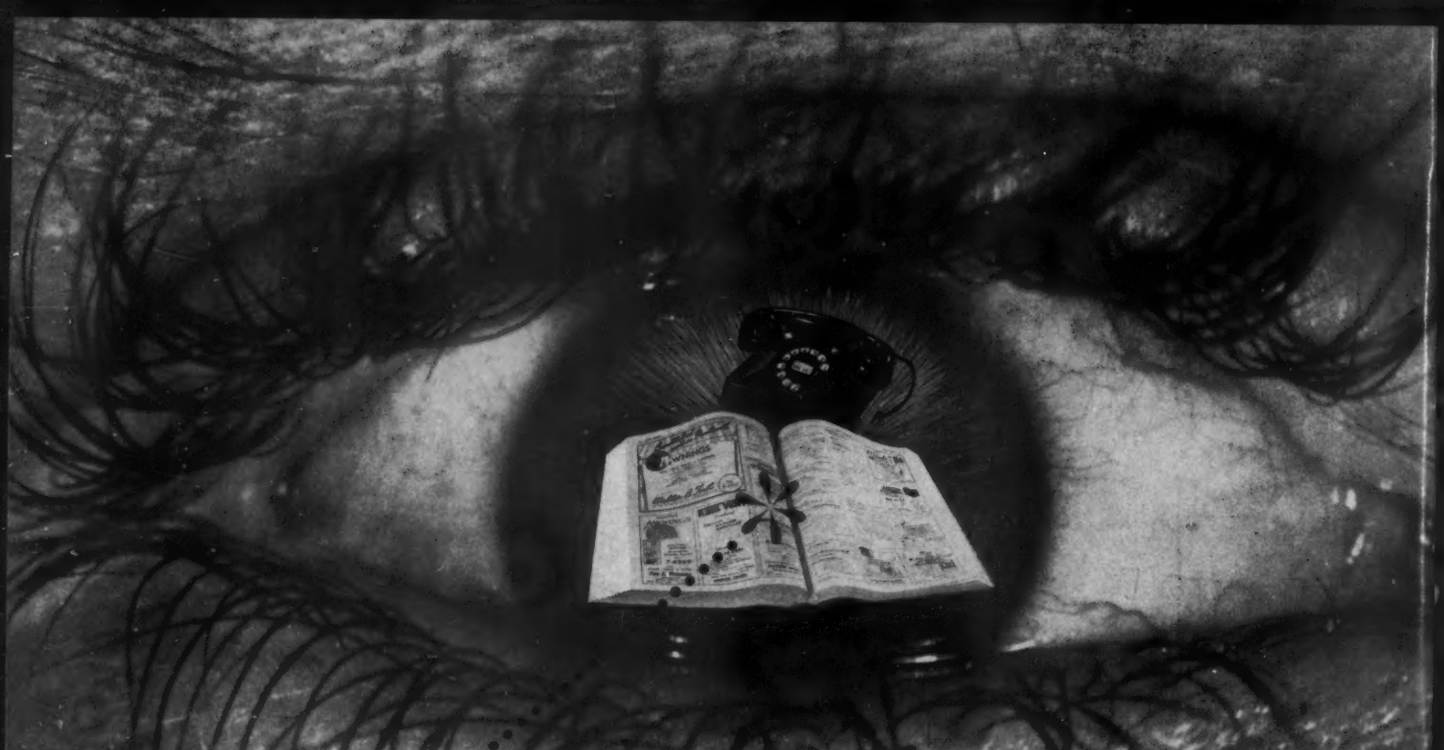

AS YOUR SUBSCRIBERS SEE YOU

No matter how much money you have spent on new central office equipment in order to improve service—your subscribers still judge your progressiveness largely by the directories and instruments you furnish.

This is logical, for your subscribers rarely see your vast array of new central office equipment, but they see your directory many times every day.

More and more telephone companies are recognizing the importance of employing specialists to design and produce directories just as they employ specialists to fabricate equipment.

In addition to being assured of subscriber satisfaction, there are other advantages to be gained by employing our organization of specialists to publish your directory. One important advantage is that we can produce a more profitable directory for you; and, at the same time relieve you of all of the bothersome details and worries that now accompany the publication of a directory.

Let our nearest representative show you exactly how our *Complete Directory Service Plan will work for your company. And, while he is in your office, let him show you the figures that prove that we can make more money for you from your telephone directory.

***Our service includes the sale of classified advertising, compilation, proofreading and printing.**

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